MINE MANAGEMENT LEGISLATION AND GENERAL SAFETY

An Up to date Objective Approach

(MINE CAPSULE)

(With up to date DGMS Circular 1935-2018 & Syllabus)

[A Handbook for FMC / SMC Exam (Coal) Restricted and Un-Restricted]

[CMR 2017, Mines Act, Mines Rules, Mine Rescue Rules,
Mine Vocational Training Rules, CEA Regulations,
General Safety, National Safety Conference
Recommendations & Mine Management]

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PREFACE

As a working professional it's very difficult to manage time to prepare for the FMC/SMC exam and carry out regular duty simultaneously.In one hand there is profession work load while on the other hand there is vast syllabus to cover up.One and only purpose of jotting down this book is to help students, working professional etc preparing for Manager's Certificate of Competency exam to get up to date comprehensive indepth knowledge of rules, regulations, act, DGMS circular, mine safety , mine management etc in a single book and in a minimum time.

Several books have been written by famous authors but their volumes are extensive and are good for subjective exam.As DGMS is now conducting managership exam online so there is an urgent need of a very good handbook where reader could find all the syllabus in a single book.The present small effort brings together all the regulations,rules,act,bye laws,safety, management along with DGMS circular. The book has been written reader friendly and based on new objective approach with practice paper, important notes , formulae. Points which are very important from the exam point of view have been made bold and eye catchy so that reader don't miss those points.

The endeavor has been to present lengthy and vast material in a brief and easy to understand manner.I hope reader find the book of use and interest.

I am grateful to my friend Mr Ankur Kumar for his valuable suggestions, feedback & unprecedented support.I would also like to thank my colleagues for their valuable input.

Any suggestion for the improvement of the book will be highly appreciable. Mail your suggestions, queries on minecapsule@gmail.com

Author

Introduction to the Author / Contents

Mr Ranjan Kumar has done B.Tech in Mining Engineering from IIT(BHU) Varanasi& has qualified DGMS Online FCC (Coal) exam in his very first attempt.The present book is a small effort to present the vast syllabus based on latest objective pattern. Some of the salient features of the book are:

1) All the rules, regulations & act have been compiled and has been presented in a simple language along with up to date DGMS Circulars (From 1935 to 2018), National Safety Conferences, Bye Laws, Gazette Notification etc.

2) Questions of FMC & SMC 2014Exam which was held in month of September' 2014 have been provided in the same chapter from which they were asked, for the reader to know the standard of the exam.

3) Multiple choice questions have been provided after each chapter

4) Two practice paper have been given at the end of the book to get the reader acquainted with the pattern and level of DGMS questions.

5) Various terms and formulae's which are not defined in the Rules, regulations, act have been defined and explained under the heading " Extra Shots" for the better understanding of that topic.

6) Mine Management which reader find difficult to understand has been elaborated and explained reader friendly with examples, formulae's and mcq for each topic.

7) Frequently asked interview questions along with important topics for interview have Been provided.

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Coal Mines regulations 2017

(with DGMS Circulars 1935 - 2018)

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RETURNSNOTICESANDRECORDS

3. Notice of opening- (1) The notice for commencement of any mining operation under section 16 of the Actshall be submitted inForm 1-Ato the Chief Inspector and a copy thereof to the Regional Inspector.The form shall be accompanied by a plan showing the boundaries of the mine and the shafts or opening of the mine, trijunction or revenue pillars and other prominent and permanent surface features.

(2) The notice shall be accompanied by-
(a) a copy of the surface plan
(b) a copy of Safety Management Plan

Section 16 Mines Act . Notice to be given of mining operations

> (1) The owner, agent or manager of a mine shall , before the commencement of any mining operation, give to the CI, the Controller, Indian Bureau of Mines and DM of the district in which mine is situated .
>
> (2) Such notice shall reach at least one month before the commencement of any mining operation.

If the boundary of a mine is changed ,a plan showing the new boundary , shall be submitted within seven daysof the said change.

(3) When a mine has been opened, the owner, agent or manager shall forthwith communicate the actual date of opening to the Chief Inspector, the Regional Inspector and to the District Magistrate

> *In the case of a mine which is situated partly in one district and partly in another, the District Magistrate for the purposes of these regulations shall be the District Magistrate authorised in the behalf by the Central Government.*

4. Annual Returns- (1) The owner, agent or manageron or before 1st of February in every year shall submit to the CI,RI and to DM annual returns in respect of the preceding year in Form 3.

(2) If a mine is abandoned or working thereof is discontinued over a period exceeding 60days or if a change occurs in the ownership of a mine, the annual return shall be submitted within 30 days of abandonment or change of ownership or within 90 days of discontinuance as the case may be.

Abandoned workingmeans such working as have been abandoned with no intention ofworking in future.

Disconlinued workingmeans such working in a mine as have been discontinued for some reasons and are inaccessible or rendered inaccessible but are likely to be worked again.

5. Notice of abandonment, closure or discontinuance.--(1) When it is intended to abandon or close a mine or seam or to discontinue workings thereof for a period **exceeding sixty days**, the owner, agent or manager shall give a notice in the **(Form 1-C for abandonment, closure, Form 1-D for discontinuance)** to the Chief Inspector, the Regional Inspector and to the District Magistrate stating the reasons for such abandonment, closure or discontinuance and the number of persons likely to be affected thereby, not less than thirty days before such abandonment or discontinuance.

(2) In case when it is intended to abandon or discontinue for more than 60days, any working belowground over which is situated any property vested in the Government or any local authority or or any building or permanent structure not belonging to the owner, the owner, agent or manager shall **not less than 30days** before the date of such abandonment or discontinuance give notice to **the CI and the RI.**

FMC Exam 14

When a mine is intended to be abandon , notice of abandonment shall be sent to ________?

a. RI
b. CI
c. RI & CI
d. RI or CI
e. RI, CI & DM

Ans : (e) RI, CI& DM

(3) Within seven days of such abandonment or discontinuance, the owner, agent or manager shall give notice to the CI, the RI and the DM in Form 1 –C (Notice of closure, abandonment) & Form 1 - D (Notice of discontinuance)

Pumping in disused shafts—In case of pumping operations in disused shafts prior information should be sent to the DGMS and pumping shall not be started without making arrangements for mechanical ventilation.

(Cir.37/1973)

6. Notice of re-opening – (1) When it is intended to reopen a mine or seam after abandonment or after discontinuance for a period exceeding 60 days, the owner, agent or manager shall not less **than 30 days**, before resumption of mining operation, givenotice to the CI, the RI and the DM in Form 1- B.

(2) When a mine has been re-opened , the owner, agent or manager shall forthwith communicate the actual date of the reopening to the CI,RI and to the DM.

7. Notice of change in ownership and appointment of agent, manager, etc.- (1) **When a change occurs in the name or ownership of a mine** or the address of the owner, the owner, agent or manager shall **within seven daysfrom** the date of the change, give notice to the **CI, RI and the DM in following forms:**

Regulation 7 Form 2- A Notice of change in name of mine
Regulation 7 Form 2-B Notice of change in the ownership of a mine
Regulation 7 Form 2 -C Notice of change in the address of the Owner, agent or manager
Regulation 7 Form 2-D Notice of appointment of agent, manager, etc.
Regulation 7 Form 2 -E Notice of termination of agent, manager, etc.

Provided that where the owner of a mine is a firm or other association of individuals, a change-
(i) of any partner in the case of a firm;
(ii) of any member in the case of an association;
(iii) of any director in the case of a public company; or
(iv) of any shareholder in the case of a private company;
shall also be intimated to the Chief Inspector and the Regional Inspector, within seven daysfrom the date of the change.
(2) When the ownership of a mine is transferred, the previous owner or his agent shall makeover to the new owner or his agent, within a period of seven days of the transfer of ownership,all plans, sections, reports, registers and other records maintained in pursuance of the Actand of these regulations, or orders made thereunder, and all correspondence relating to theworking of the mine relevant thereto;and when the requirements of this clause have beenduty complied with, both the previous and the new owners or their respective agents shallforthwith inform the Chief Inspector and the Regional Inspector in writing.
(3) When any appointment is made of any agent, manager,engineer, surveyor, ventilation officer, safety officer, assistant manager or when the employment or any such person is terminated or any such person leaves the

said employment or when any change occurs in the address of any agent or manager, the owner, agent or manager shall within seven days from the date of such appointment, termination or change give to the CI and the RI notice in FORM I.

(4) The owner of a mine shall submit in writing to the Chief Inspector and the Regional Inspector, a statement showing the name and designation of every person authorised to act on behalf of the owner in respect of management, control, supervision or direction of the mine.

Any change, addition or alteration in the names or other particulars of the statement referred above shall be reported in writing to the Chief Inspector and Regional Inspector within seven days from the date of change, addition or alteration.

8. Notice of dangerous occurrence or accident.- (1) When there occurs in or about a mine,

(a) an accident causing loss of life or serious bodily injury in connection with any mining operation; or

(b) a readily identifiable event with potential to cause an injury to persons at work, hereinafter referred to as "dangerous occurrence", such as –

(i) an explosion or ignition;

(ii) a spontaneous heating or outbreak of fire, or appearance of smoke, or other indication of heating or outbreak of fire;

(iii) fire in any part of workings or in any machinery;

(iv) fall from height of any excavation, loading or transport machinery;

(v) bursting of equipment under pressure;

(vi) an influx of inflammable or noxious gases;

(vii) an irruption or inrush of water or other liquid matter;

(viii) an instantaneous failure of a pillar, part of a pillar or several pillars of coal (i.e., a 'bump') in working below ground;

(ix) a premature collapse of any part of the working;

(x) any accident due to explosives;

(xi) a breakage or fracture of rope, chain, headgear, pulley or axle or bearing thereof, or other gear by which persons or materials are lowered or raised;

(xii) an over winding of cages or other means of conveyance while men or materials are being lowered or raised;

(xiii) a breakage or fracture of an essential part of winding engine, crankshaft, coupling, bearing, gearing, clutch, drum or drum shaft, or failure of emergency brake;

(xiv) a bursting of any equipment containing steam, compressed air or other substance at high pressure;

(xv) a breakage, fracture or failure of an essential part of any machine or apparatus whereby the safety of persons may be endangered;

(xvi) a slide causing injury to any person, damage to any machinery, or interruption of normal mining operations;

(xvii) failure of dump or side in opencast working;

(xviii) a failure of any structure or installation whereby the safety of persons may be endangered; or

(xix) spark generated due to electrical flash-over causing burn injury to any person,

Mines Act 23(e) an over winding of cages or other means of conveyance in any shaft where persons or materials are being lowered or raised.

Mines Act 23(g) any other accident which may be prescribed

The owner, agent or manager shall **forthwith** inform the RI about the occurrence and **within** 24 hours of every such occurrence, give notice thereof in Form 4-A to the DM, the CI,and the RI and in case of an accident causing loss of life or serious bodily injury in connection with mining operation, to Competent Authority for payment of compensation.

2. The owner, agent or manager shall exhibit a copy of notice **on notice board for not less than 14 days** from the date of such exhibition.

In case of fatal or serious accident, manager is to make an inquiry himself (or through AM) and send a copy to DGMS and DMS within **15 days** of the accident.

Mines Act 23 (2)

Where a notice given under 9(1) related to an accident causing loss of life , the authority shall make an inquiry into the occurrence **within two months** of the receipt of the notice.

Mines Act 23 (5)Whenever there occurs in or about a mine an accident causing loss of life or serious bodily injury to any person the place of accident shall not be disturbed or altered before arrival or without the consent of the CI or Inspector whom notice of the accident is required to be given under sub-section (1) unless such disturbance or alteration is necessary to prevent any further accident , to remove bodies of deceased, or to rescue any person from danger:

Work may be resumed at the place of the accident if CI or th said inspector fails to inspect the place of accident within 72 hoursof the time of accident.

(b) When an accident causing loss of life or serious bodily injury occurs in or about a mine in connection with the generation, storage, transformation, transmission , supply or use of electrical energy, the owner, agent or manage shall also forthwith inform the **Electrical Inspector** of mines.

As per Intimation of Accident Rules, 2005, a report in **Form A**is to be sent to the **Electrical Inspector**of mines **within 48 hours**of the knowledge of occurrence of any type electrical injury.

(2) If death results from any injury already reported as serious or if any injury other than the serious injury becomes serious , the owner, agent or manager shall within 24 hours of his being informed of the CI, the RI and to the Competent Authority for payment of compensation and to electrical inspector if death or injury is connected with electrical energy.

Serious bodily *injurymeans any injury which involves; or in probability wil involvethe permanent loss of any part or section of a body or the use of any part or section of abody, or the permanent loss of or injury to the sight or hearing or any permanentphysical incapacity or the fracture of any bone or one or more joints or bones of anyphalanges of hand or foot.*

Reportable injury*means any injury other than a serious bodily injury which involves,or in all probability will involve, the enforced absence of the injured persons from work fora period of seventy-two hours or more.*

Minor Injury*means any injury other than a serious bodily injury or reportable injury , which results into the enforced absence of the injured persons from work for a period exceeding 24 hours and less than 72 hours.*

Occurrence of Reportable accidenthas to be entered in a register in Form J (Mine Rules 76(1) and a copy of such entries is to be furnished to the CIM and to the concerned inspector once in a quarter. (Mines Act-23)**

SMC Exam'14

Reportable injuries shall be recorded in Form ______and a copy of such entries shall be sent to concerned inspector once in______?

a) J– once in a quarter
b) J – once in a month
c) K– once in a month
d) K – once in a quarter

Ans : (a)

*Intimation of even **minor (reportable) accidents involving 5 or more** persons are to be reported immediately to the CI and RI in the same manner as for fatal or serious accident.*

(Cir. Legis. 4/1976)

Particulars of **minor accident** has to be entered in a register in **Form K** (Mine Rules 76(2) and a copy of the entries is required to be sent to the **CIon or before the 20th January** in the year following that to which the entries relate. (Mines Act-23)

(3) In respect of very person killed or injured the owner, agent or manager shall within 7 days of the occurence , send the CI particulars in Form 4-B.

*Notice in **Form 4-C** should be sent **within 15 days** of the **injured returningto duty**. (cir. Legis. 2/1993)*

*In case of **accident during storage or transit of explosives**, notice shall be given forthwith to (a) **the Chief Controller of explosive within 24 hours (b) Controller of Explosive of jurisdiction (c) Officer incharge of nearest police station.***

***Post-mortem examination in case of death by heart failure**— Failure of heart may be caused inthe natural way or as a result of any injury received while engaged in any operations connected withmining. It will, however, be appreciated that the fact of death having been caused due to heart failurecan be established only by means of a post-mortem examination of the dead body.*

In case it is felt that death has been caused by heart failure in any operation whatsoever, while sendinginformation of accident in or about the mine to various authorities an intimation giving details of theoccurrence and pointing out that it is not a mining accident should *also be sent to the local Police. Thepolice authorities may then take necessary action for sending the dead-body for a post-mortemexamination. A copy of the post-mortem report should be submitted to D.G.M.S. as soon as possible.*

In case of non-compliance with these instructions, the occurrence may be treated as an accident comingwithin the purview of the Mines Act.

(Cir. 37/1959 & 30/1960)

Report of every big or major roof fall- *Occasionally roof falls occur in mines which do notresult in any serious or fatal accident, or could be termed as 'premature collapse of any part of theworkings' so as to come within the mischief of the provisions of Regulation 9 of Coal MinesRegulations, (Notice of Accident).*

All the same,every big or major fall in a mine whether it is in a development district or at a longwall face or at any other place in a mine, whether or not it is a working place and irrespective of face whether it was anticipated or not, is a useful pointer to general deterioration of roof condition at that place. Report of every such fall ***should be furnished to RI within 24 hours of occurrence in Form IV-A***

(Cir 63/1973)

Notice is required to be furnished when an overwinding of cages or other means of conveyance occurs even while materials are being raised or lowered. *(Cir Tech 8/1983)*

Manshifts lost on account of accidents—*The Directorate of Mines Safety compiles the frequencyof the incidence of fatal and serious accidents in relation to persons employed in the mines. For aproper assessment of the incidence of accidents in mines there is a concomitant index viz. the SeverityRate. In respect of the fatalities, the standard number of mandays lost is 6000.*

Equivalent Man days lost due to an injury= 6000x Percentage of loss of Earning Capacity
(Cir. 9/1974)

Criteria to determine accidents- Mining statistical, Mining non-statistical, Non-mining

Mining Statistical Accident

A accident shall be termed as Mining statistical if :

i. That occurred within the boundary of mine and person(s) involved in the accident is employed in mine and accident occurred due to any mining operation or any machinery/equipment/apparatus deployed therein or due to negligence or willful actions by person employed in mine , that has endangered his life or life of other persons or negligently or willfully omit to do anything, necessary for safety of person employed therein, and/or
ii. That occurred within the boundary of mine and person(s), employed in mine has/have gone in any part of mine other than that part in which he/they work and involved in accident due to any mining operation or any machinery/equipment/apparatus deployed therein or due to negligence or willful actions by person employed in mine , that has endangered his life or life of other persons or negligently or willfully omit to do anything, necessary for safety of person employed therein.

Mining Non-Statistical Accident

I. Person(s) not employed in mine is/are involved in accident occurred within the boundary of mine due to any mining operation or any machinery/equipment/apparatus deployed therein or due to negligence or willful actions by person employed in mine , that has endangered his life or life of other persons or negligently or willfully omit to do anything, necessary for safety of person employed therein, and/or
ii. Any operation occurred due to any operation which is incidental to mining operation, in an area outside the boundary of mine whether the person(s) involved in accident is/are employed in mine or not.

Non- Mining Accident

i. A accident shall be termed as Non- Mining Accident if it occurs outside the boundary of mine, whether person involved in accident is/are employed in mine or not due to any operation which is not incidental to mining operation.The consumer truck, transporting mineral involved in an accident outside the boundary of mine shall not be treated as an operation which is incidental to mining operation.
ii. Any death due to natural cause shall also be termed as Non-mining accident.

(Cir. Legis 01/2014)

Accidents/Incidences due to exposure to high atmospheric temperature

i. **Heat stroke :-** Heat stroke generally occurs when body stop adjusting to the temperature by sweating and can't keep up with the heat. It is characterized by hot, dry, red skin that is warm or hot to touch and immediate medical attention is needed in such cases.

ii. **Heat exhaustion**:- Heat exhaustion is caused by loss of large amount of fluid from the body. A worker with heat exhaustion continues to sweat but their body cannot keep up with the heat. The worker may have a headache, fatigue or flu like symptoms. In most cases workers need to rest, cool down and drink plenty of fluid

iii. **Heat cramps** :- workers may suffer from cramps and painful muscle spasm. This happens when workers drink water to replace fluid they loose from sweating but don't replace the body's loss of salt. Drinking fluids with electrolyte replacements ingredients are recommended in such cases

iv. **Heat syncope** :- Heat syncope is a fainting episode or dizziness that usually occurs with prolonged standing or sudden rising from sitting or lying position. Factors that may contribute to heat syncope include dehydration and lack of acclimatization.

v. **Heat rash** :- Heat rash is a skin irritation caused by excessive sweating during hot or humid weather.

(Cir. Tech 01/2015)

9. Notice of disease-Where any person employed in a mine contacts any disease notified by the Central Govt. in the Official Gazette, the owner, agent or manager shall, within three days of his being informed of the disease, give notice thereof in Form 5 to the Chief Inspector, the Regional Inspector, the Inspector of Mines (Medical), the District Magistrate, and to the Competent Authority for payment of compensation.

Notified Diseases are –

1.Pneumoconiosis
2. Silicosis
3. Asbestosis
4. Coner of lung or the stomach or the pleura and peritoneum(i.e. Mesothelioas)
5. Manganese Poisoning (Nervous Type)
6. Noise induced hearing loss
7. Contact Dermatites caused by direct contact with chemicals
8. pathological manifestation due to radium orradio-active susbstances.

(For disease 6,7 & 8 Cir. Legis. 1/2011)

MULTIPLE CHOICE QUESTIONS

Returns, Notices & Records

1. As per CMR 2017 notice of opening of a mine shall be submitted in ________.
   a) Form 1-A
   b) Form 1-B
   c) Form 1-C
   d) Form 1-D
2. Plan accompanied with notice of opening of mine shall show following features:
   i. Mine boundaries
   ii. Revenue pillar
   iii. Shaft
   iv. Seam thickness
   a) I
   b) I,II & III
   c) I & II
   d) All
3. As per CMR 2017, if there is change in boundary of a mine then plan showing the new boundary shall be submitted within________ of the change.
   a) 7 days
   b) 30 days
   c) 3 days
   d) 15 days
4. When a mine has been opened the OAM shall____________communicate the actual date of opening to CI,RI& DM.
   a) Within 7 days
   b) Within 15 days
   c) Forthwith
   d) After 3 days
5. In case of a mine whose boundaries lies in two district , District magistrate of that mine will be the one ____________.
   a) In whose jurisdiction larger mine areas lies
   b) Any one of them can act
   c) CI will decide
   d) Authorized by central govt.

6. Annual return shall be submitted on or before ____________ in respect of the preceding year.
   a) 20th February

a) 1st February
b) 14th February
c) 1st January

7. Annual return shall be submitted to ________
   i. CI
   ii. RI
   iii. DM
   a) I & II
   b) I & III
   c) I,II or III
   d) I, II & III

8. Notice of notified disease is to be given in ________.
   a) Form 4-A
   b) Form 5
   c) Form 6
   d) Form 7

9. As per CMR 2017 match the following Forms with their description

	Forms		Description
P	Form 3	I	Contravention found during inspection
Q	Form 4-A	II	Notice of notified disease
R	Form 5	III	Annual return
S	Form 6	IV	Notice of accident

a) P-IV,Q-III,R-II,S-I
b) P-I,Q-IV,R-II,S-III
c) P-III,Q-IV,R-II,S-I
d) P-III,Q-IV,R-IV,S-I

10. Annual return shall be submitted in ________.
   a) Form 1-A
   b) Form 2-B
   c) Form 3
   d) Form 4-A

11. If a mine is abandoned then in that case annual return shall be submitted within________ of abandonment.
   a) 30 days
   b) 60 days
   c) 45 days
   d) 90 days

12. Abandoned working means such working________
   a) With intention of working in future
   b) Which has been suspended for more than 60 days
   c) With no intention of working in future
   d) Which has been suspended due to rainfall

13. Disused means such working________
   a) With intention of working in future
   b) Which has been suspended for more than 60 days
   c) With no intention of working in future
   d) Which has been suspended due to rainfall

14. Notice of abandonment shall be given to ________
   a) CI
   b) RI
   c) CI, RI& DM
   d) CI or RI

15. Notice of discontinuance of working for more than 60 days shall be given not less than ________ before discontinuing.
   a) 30 days
   b) 40 days
   c) 60 days
   d) 90 days

16. Notice of abandonment of working shall state________
   i. Reason for abandonment
   ii. Number person likely to be affected
   iii. Last working level
   iv. Trijunction pillar location
   a) I & II
   b) I, II & III
   c) I
   d) All

17. It is intended to abandon underground mine working above which a government school is present. Notice of such abandonment shall be given to ________.
   a) CI or RI
   b) CI & RI
   c) State govt.
   d) CI , RI & State govt.

18. When a mine has been abandoned , notice shall be given to CI , RI & DM within ________ of such abandonment.
   a) 7 days

b) 30 days
c) 40 days
d) 60 days

19. Notice of re-opening of a mine after abandonment for more than 60 days, shall be given to ________.

a) CI & RI
b) CI ,RI & DM
c) RI & DM
d) CI & DM

20. When a mine has been reopened owner, agent or manager shall________ communicate the actual date of re-opening to the CI & RI.

a) Within 7 days
b) Forthwith
c) Within 30 days
d) Within 45 days

21. Whenever there is a change in ownership of mine owner, agent or manager shall give notice to ________

a) CI
b) RI
c) CI & RI
d) CI or RI

22. Whenever there is a change in ownership of mine owner, agent or manager shall give notice to CI & RI within________ from the date of change.

a) 7 days
b) 15 days
c) 30 days
d) 45 days

23. Notice of appointment of manager shall be given by owner or agent to the ________.

a) CI
b) RI
c) CI & RI
d) CI or RI

24. Notice of appointment of manager shall be given in ________.

a) Form1-A
b) Form 2-D
c) Form 3
d) Form 4-A

25. There was an explosion in mine. As a manager you should inform the RI about the incident________.

a) Immediately
b) Within 72 hours
c) Within 24 hours
d) Within 48 hours

26. Notice of which of the following accident shall be sent in Form 4-A

a) Influx of noxious gas
b) Serious bodily injury
c) Spontaneous heating
d) All the above

27. According to CMR 2017 notice of occurrence of accident shall be sent in________.

a) Form 4-A
b) Form 4B
c) Form 4C
d) Form 5

28. Notice of occurrence of accident shall be sent by owner, agent or manager ________to DM, CI & RI.

a) Within 24hours
b) Within 72 hours
c) Within 48 hours
d) Immediately

29. There was an accident in a mine causing serious bodily injury to 2 persons, reportable injury to 6 person & minor injury to 3 persons. Intimation shall be given to CI & RI of the-

i. Serious bodily injury
ii. Reportable injury
iii. Minor injury

a) Only I
b) I & II
c) Only II
d) I,II & III

30. In case of fatal/serious accident, manager shall make an enquiry & send a copy to CI & RI within________ of accident.

a) 15 days
b) 14 days
c) 7 days
d) 72 hours

31. Inspector shall make an enquiry to an accident involving loss of life within________ of the receipt of notice.

a) 15 days

b) Two months
c) 72 hours
d) 14 days

32. Work may be resumed at the place of accident if inspector fails to inspect the place of accident within__________ of the time of accident.

a) 24 hours
b) 72 hours
c) 48 hours
d) 15 days

33. There was an accident in a mine which leads to death of two persons. Place of accident was altered before the arrival of inspector. Probable reason for such alteration may be:

a) To hide the evidence
b) To prevent further accident
c) To resume production
d) To bring place to normal state

34. Particulars of deceased person shall be sent to CI in

a) Form 4-A
b) Form 4B
c) Form 4C
d) Form 5

35. A person during loading operation got his hand fractured. He returned to work within 52 hours after plastering his hand. This injury caused to him will be treated as__________

a) Reportable injury
b) Serious injury
c) Minor injury
d) Reportable or minor injury

36. Reportable injury has to be entered in________

a) Form J
b) Form K
c) Form IV A
d) Form IV B

37. Notice in Form IV C should be sent within__________ days of injured person retuning to duty.

a) 15 days
b) 7 days
c) 3days
d) 24 hours

38. There was a major roof fall in a development district of a mine. Report of such fall should be furnished to RI within______

a) 24 hours
b) 3 days
c) 7 days
d) Not necessary

Answers

1.a 2.b 3.a 4.c 5.d 6.b 7 d 8.c 9.b 10.c 11.a 12.c 13.a 14.c
15.b 16.a 17.b 18.a 19.b 20.b 21.c 22.a 23.c 24.b 25.a 26.d
27.a 28.a 29.b 30.a 31.c 32.b 33.b 34.b 35.b 36.a 37.a 38.a

Examinations and Certificates of Competency and of Fitness

10. Board of Mining Examination – (1) For the purpose of these regulations, there shall be constituted a Board of Mining Examinations

(2) The Board shall consist of the **Chief Inspector**, who shall be its Chairman ex-officio, and five members possessing degree in mining engineering, and

(a)first class Manager's Certificate; or

(b)practical experience of not less than two years in management, control, supervision and direction of a coal mine or part thereof; or

(c)service in an institution imparting education in mining engineering at the degree or equivalent level; or

(d)engagement in mining research or planning,to be appointed by the Central Government:

Provided that the Board shall be so constituted that it shall include at least three members possessing qualifications laid down in clauses (a) and (b) and at least one member possessing qualifications laid down either in clause (c) or in clause (d).

(3) Every member (other than the Chairman) of the Board shall hold office for **a period of three years** from the date of the notification appointing him a member of the Board or until hissuccessor is appointed and takes charge, whichever is later :

Provided that –

(i) a member may at any time resign his office;

(ii) a member appointed under clause (c) of sub-regulation (2) shall cease to hold office upon his ceasing to serve in any such institution, as is referred to in that clause;

(iii) a person appointed to fill a vacancy caused by reason of the death, resignation, or by reason of cease of office under sub-clause (ii), of a member, shall hold office for the remaining period for which such member would have, but for such reason, continued as member.

(4) A person who holds, or who has held, office as member of the Board shall, subject to the other provisions of this regulation, be eligible for re-appointment to that office.

(5) A member of the Board (other than the Chairman) shall receive such remunerations as theCentral Government may fix.

(6) An Inspector nominated in this behalf by the Chief Inspector shall act as Secretary to the Board (hereinafter referred to in this regulations as the Secretary.

(7) Notwithstanding anything contained in this regulation, the Central Government may, if satisfied that it is necessary so to do in the public interact, re-constitute the Board even though the term of office of all or any of the members thereof has not come to an end.

(8) Meetings of the Board shall be held as and when the Chairman considers them necessary, and unless otherwise decided by the Chairman, all meetings of the Board shall be held at Dhanbad.

(9)(a) For every meeting of the Board, **not less than ten clear days prior notice** intimating thetime and place of the proposed meeting and signed by the Chairman or the Secretary shall begiven to each member who is not absent from India.

(d) In cases of urgency, an emergent meeting may be called for by Chairman at any time, by intimating the members,only two days in advance, of the time and date of such meeting and the subject matter for discussion at such meeting:

(10)(a) The Chairman shall preside at every meeting of the Board.

(b) If the Chairman is absent for any reason, the members present shall elect one from among themselve to preside over the meeting, and the members so elected shall, for the purposes of that meeting, have all power of the Chairman.

(11) No business shall be transacted at a meeting of the Board unless **atleast three members**,including the Chairman, are present.

Provided that if at any meeting there is no quorum as aforesaid, the meeting shallautomatically stand adjourned to a date which is **seven days later** or if that day is a public holiday to the next working day and the time, place and agenda for the adjourned meeting shall remain unchanged. It shall there upon be lawful to dispose of the business at such meeting irrespective of the number of members attending.

(12)(a) All matters which the Board is required to consider shall be considered at its meeting,or, if the Chairman so decides, by circulation of the papers, to every member who is notabsent from India.

(b) When any matter is referred to by circulation as aforesaid, any member can request that itshould be considered at a meeting of the Board and the Chairman may direct that it shall beso considered but when two or more members so request, the Chairman shall direct that itshall be so considered at a meeting to be held.

(13)(a) The Secretary shall place, before the Board a list of business to be transacted at the meeting.

(b) No business which is not included in such list shall be considered unless the Chairman permits.

(14)(a) Every matter at a meeting, shall be decided by the majority of votes of the members present at such meeting.

(b) Every matter referred to the members by circulation under sub-regulation (13) shall be decided by the majority opinion of the members to whom the papers were circulated, unlessthe Chairman reserves it for consideration at a regular meeting to be held later.

(c) In case of equal division of votes or opinions of the members, Chairman shall have a casting vote or opinion.

(15)(a) The Secretary shall record the minutes of each meeting in a bound-paged book kept for the purpose and copies of such minutes of the meeting shall be circulated to all memberspresent in India.

(16)(a) The Chairman in addition to any other powers and duties conferred upon him under these regulations, shall :

(i) present all important papers and matters to the Board as early as possible;

(ii) the issue orders for carry out the decisions of the Board;

(iii) have power to refer, in his discretion, any matter to the Central Government for their orders; and

(iv) have powers generally to take such action or pass such orders necessary to implement the decisions of the Board.

(b) The Chairman may, during his temporary absence by reason of leave or otherwise, authorise any member of the Board to perform all or any of the duties of the Chairman duringsuch absence.

11. Certificate granted by Board.- – (1) Certificates under these regulations shall be granted by the Board.

(2) Certificates granted by the Board shall be valid throughout the territories to which these regulations extend, and shall be of the following kinds –

(a) First Class Manager's Certificate

(b) Second Class Manager's Certificate;

(c) Surveyor's Certificate;

(d) Overman's Certificate;

(e) Sirdar's Certificate;

(f) Winding engineman's certificate (hereinafter referred to as a Engine Driver's Certificate) to drive a winding engine of any type or class

(g) Gas-testing Certificate;

13. Submission of applications – (1) Applications for an examination conducted by the Boardshall made to the Board **not less than 60 days prior** to the date fixed for the examination andon a form supplied for the purpose.

(2) Notice regarding the date and place of the examinations for the Manager's, Surveyor's and Overman's certificates shall be published under the order of Board, in such periodicals asthe Board may direct, not less than 60 days prior to the fixed by the Board for receiving applications.

14. Age and general qualifications of candidates – (1)(a) No persons shall be admitted as a candidate at any examination held by the Board unless he is **20 years** of age.

(b) No persons shall be admitted as a candidate as any examination for a Manager's, Surveyor's, Overman's, Sirdar's or Shot-firer's Certificate unless he holds a valid first-aid certificate of the standard of the St. John Ambulance Association (India):

Provided that if any candidate satisfies the Board that he has not had sufficient opportunity toobtain such first-aid certificate, the Board may, by order in writing, admit him to theexamination on such conditions, if any, as it thinks fit to impose.

(c) Every application for any examination as aforesaid shall be accompanied by:

(i) **a certificate of age**

(ii) **a medical certificate** obtained not more than one year prior to the date of his application, from a qualified medical practitioner not below the rank of a Civil Assistant Surgeon or from a Certifying Surgeon or from a medical practitioner holding at least a degree in Bachelor of Medicines and Bachelor of Surgery (M.B.B.S.) and registered with Medical Council of India, certifying the candidate to be free from deafness, defective vision or any other infirmity, mental or physical, likely to interfere with the efficiency of his work; and

(iii) **a character certificate**

(2) No persons shall be admitted as a candidate to any examination for Manager's, Surveyor's, Overman's or Sirdar's Certificate unless he has passed the Secondary School examination of a recognised Board of its equivalent, and for an Engine-driver's or Shot-firer'sCertificate unless he satisfies the Board that he is literate:

4.No person shall be admitted as a candidate to any examination for Manager's Certificate, Surveyor's Certificate, Overman's Certificate or Sirdar's Certificate, unless he has passed the

senior secondary school examination or Intermediate examination or its equivalent from a recognised Board or University or passed a Diploma or Degree in Engineering or other equivalent qualifications approved in that behalf by the Central Government, and for an Engine Driver's Certificate unless he satisfies the Board that he is literate.

5.(a)No person shall be admitted as a candidate at any examination for a Manager's or an Overman's Certificate, which is not restricted to mines having opencast working only, unless he has obtained at least a Sirdar's Certificate, which is not restricted to mines having opencast working only and a Gas Testing Certificate; and

(b)no person shall be admitted as a candidate at an examination for Manager's Certificate or Overman's Certificate restricted to mines having opencast working only, unless he has obtained at least a Sirdar's Certificate:

SMC Exam 2014

Every application for competency examinations shall be accompanied by the following certificates/ documents except

(1) Certificate of Age

(2) Certificate of Fitness

(3) Character Certificate

(4) Experience Certificate

(5) Domicile Certificate

Ans.(5)

15. Practical experience of candidates for Manager's Certificate examination.- (1) No person shall beadmitted as a candidate at any examination for a First or Second Class Manager's Certificate other than anexchange Certificate, unless the Board is satisfied that he hashad practical experience in coal mine as prescribed under sub-regulation (2) for a period of not less than sixand five years respectively:

Provided that a candidate-

(a)who has received a diploma in mining or mining engineering or other equivalent qualificationapproved in that behalf by the Central Government, such period of experience shall bereduced to five and four years respectively; and

(b)who has passed a degree in mining engineering or other equivalent qualification approved inthat behalf by the Central Government, such period shall be reduced to two years for First Class Manager's Certificate;

First Class Manager's Certificate - Examination:

Qualification	Period, Nature & details of Practical experience.
Degree in Mining Engineering or other equivalent qualification approved in that behalf by the Central Government OR Diploma in Mining or Mining engineering or other equivalent qualification approved in that behalf by the Central Government OR Senior Secondary School Examination or Intermediate examination or its equivalent from a recognized Board or University or Diploma or Degree in any subject other than Mining Engineering or other equivalent qualification approved in that behalf by the Central Government.	Not less than One year of practical experience in a coal mine having below ground workings after – possession of Second Class Manager's Certificate, in a capacity requiring – the possession of Second Class Manager's Certificate or Overman's Certificate.

Second Class Manager's Certificate- Exemption:

Qualification	Period, Nature & details of Practical experience.
Degree in Mining Engineering or other equivalent qualification approved in that behalf by the Central Government	Not less than One year of practical experience in a coal mine having belowground workings after possession of the requisite academic qualification.

Second Class Manager's Certificate- Examination:

Qualification	Period, Nature & details of Practical experience.
Diploma in Mining or Mining engineering or other equivalent qualification approved in that behalf by the Central Government	Not less than three years of practical experience in a coal mine having belowground workingsafter – possession of Overman's Certificate. in a capacity requiring – the possession of Overman's Certificate or Sirdar's Certificate.
Senior Secondary School Examination or Intermediate examination or its equivalent from a recognized Board or University or Diploma or Degree in any subject other than Mining Engineering or other equivalent qualification approved in that behalf by the Central Government.	Not less than two years of practical experience in a coal mine having belowground workings after – possession of Overman's Certificate, in a capacity requiring – the possession of Overman's Certificate or Sirdar Certificate

First Class Manager's Certificate (Restricted to mines having opencast workings only) - Examination:

Qualification	Period, Nature & details of Practical experience.
Degree in Mining Engineering or other equivalent qualification approved in that behalf by the Central Government OR Diploma in Mining or Mining engineering or other equivalent qualification approved in that behalf by the Central Government OR Senior Secondary School Examination or Intermediate examination or its equivalent from a recognized Board or University or Diploma or Degree in any subject other than Mining Engineering or other equivalent qualification approved in that behalf by the Central Government.	Not less than One year of practical experience in a coal mine having belowground or opencast workings after – possession of Second Class Manager's Certificate(including Certificate which is Restricted to mines having opencast workings only). in a capacity requiring – the possession of Second Class Manager's Certificate or Overman's Certificate(including Certificate which is Restricted to mines having opencast workings only).

Second Class Manager's Certificate (Restricted to mines having opencast workings only) - Exemption:

Qualification	Period, Nature & details of Practical experience.
Degree in Mining Engineering or other equivalent qualification approved in that behalf by the Central Government	Not less than One year of practical experience in a coal mine having belowground or opencast workings after possession of the requisite academic qualification.

Second Class Manager's Certificate (Restricted to mines having opencast workings only) - Examination:

Qualification	Period, Nature & details of Practical experience.
Diploma in Mining or Mining engineering or other equivalent qualification approved in that behalf by the Central Government	Not less than three years of practical experience in a coal mine having belowground or opencast workings after – possession of Overman's Certificate(including Certificate which is Restricted to mines having opencast workings only). in a capacity requiring – the possession of Overman's Certificate or Sirdar's Certificate(including Certificate which is Restricted to mines having opencast workings only).
Senior Secondary School Examination or Intermediate examination or its equivalent from a recognized Board or University or Diploma or Degree in any subject other than Mining Engineering or other equivalent qualification approved in that behalf by the Central Government.	Not less than two years of practical experience in a coal mine having belowground or opencast workings after – possession of Overman's Certificate(including Certificate which is Restricted to mines having opencast workings only)., in a capacity requiring – the possession of Overman's Certificate or Sirdar's Certificate(including Certificate which is Restricted to mines having opencast workings only).

The experience shall be in a below ground coal mine producing not less than 1000 tonnes of coal per month or in a mine restricted to opencast workings only handling material not less than 10000 cubic metre per month. Experience in belowground mines producing less than 1000 tonnes per month of coal or in a mine restricted to opencast workings handling less than 10000 cubic metres per month of material may be approved to the extent determined by the Board.

1.3 Practical experience extending over a continuous period in a mine of less than three months in case of workers, and one month in case of officials and apprentices, at a time shall not be approved.

1.4 Every certificate of practical experience should contain precise information about the capacity in which the candidate worked, the nature of work done, and the date of commencement and termination of experience at each mine. No certificate of practical experience shall be considered unless it is granted by the Manager of the mine. Every such Certificate shall also carry the signature of the applicant attested by the Manager. Where a person working as the Manager of a mine requires a practical experience, it shall be considered only if it is granted by the Agent or Owner of the mine.No Certificate of practical experience shall be accepted unless it is in a form prescribed by the Board.

1.5 The certificate of experience must be signed & dated by the Manager with seal of office and not by Production Manager/Ventilation Officer/Senior Manager/Safety Officer etc. Capacity, nature of work done, place, experience and dates of commencement and termination of training must be clearly indicated. Candidate must sign at the specific place.Aperson working as the Manager of a mine requires a practical experience it shall besigned & dated by the Owner or Agent of the mine.

1.6 Practical experience gained during adolescent period shall not be accepted.

1.7 Practical experience gained outside duty hours is not acceptable.

1.8 Experience obtained in actual mining operations under any designation (supervisor, Assistant Supervisor, Engineer, Assistant Overman, Sirdar, Assistant Sirdar, trainee) after possessing degree/diploma in mining, may be treated as equivalent to PDPT/PGPT etc.

FMC Exam 2014

Capacity of a belowground coal mine shall not be less than _____tonnes per month for the experience to be qualified for Manager's exam.

(1) 700

(2) 800

(3) 1000

(4) 500

(5) 600

Ans-(3)

SMC Exam 2014

Requirement of practical experience for candidates at any examination for First Class or Second Class shall not be less than _____and ______years respectively who does not possess any degree or diploma in mining engineering

(1)4&3

(2) 6&5

(3) 2 & 1

(4)5 &4

(5) 3&2

Ans.(2)

16. Practical experience of candidates for Surveyor's examinations – No persons shall be admitted as a candidate at any examination for a Surveyor's Certificate unless the Board is satisfied that he has had **not less than two years' practical experience of surveying**, of whichatleast **six months** shall have been practical experience of surveying the workings **belowground** of a mine having an average monthly **output of not less than 1000 tonnes**:

Provided that such period shall be reduced to six months in the case of a candidate who hasattended classes in theoretical and practical surveying at an educational institution approvedin that behalf by the Central Government.

17. Practical experience of candidate for Sirdar's Certificate examination.-- (1) No persons shall be admitted as a candidate at any examination for a Sirdar's Certificate unless the Board is satisfied that he has had practical experience and training in a coal mine for a period of **not less than three years**.

Provided that in the case of a candidate for Shot-firer's Certificate, such practical experienceand training shall include experience and training in connection with shot-firing or a period ofatleast six months:

Provided further that such period shall be reduced to a period of one year in the case of acandidate who has received a diploma or certificate in scientific and mining training after acourse of atleast two years at an educational institution approved in that behalf by the CentralGovernment or who has taken a degree in scientific and mining subject at a university approved in this behalf by the Central Government.

(2) The nature of the practical experience required of candidates for the aforesaid examinations shall be experience of a type approved by the Board [and notwithstanding anything contained in sub-regulation (1), the Board may for the purpose approve a part of theperiod of practical experience, which has been obtained in a mine other than a coal mine upto a period not exceeding one year.

18. Practical experience of candidates for Engine-driver's Certificates – No persons shall be admitted as a candidate at any examination for an Engine-driver's Certificate unless the Board is satisfied that he has had practical experience of driving a winding engine or as an assistant to a qualified winding engine driver for a period of **atleast one year**:

Provided that after a period of two years after the coming into force of these Regulations nopersons shall be permitted to appear at any examination for a I Class Engine-driver'sCertificate unless he holds a II Class Engine-Driver's Certificate.

19. Number of attempts at examination.– No person shall be admitted for examination for a particularcertificate beyond seven attempts from the date of coming into force of these regulations.

21. Exchange Certificates – (1) The Board may grant to any person, holding a Manager's, Surveyor's, Engine driver's, Foreman's, Mate's or Blaster's Certificate granted under any law for the regulation of mines in force in any other country or under the Metalliferous Mines Regulations made under this Act, a corresponding certificate of a similar class under these regulations, [if he possess such experience and passes] such examination as the Board may stipulate:

Provided that the Board may, subject to such conditions as it may specify, exempt anyperson from appearing at the examination or part thereof for the grant of an Exchange Certificate.

(2) Every application for the grant of an Exchange Certificate [under sub-regulation (1) shall be accompanied by:

(i) a medical certificate obtained not more than one year prior to the date of his application; and

(ii) a character certificate:

Provided that in the case of a Manager's Certificate, the candidate shall also satisfy the Boardthat he has undergone, for a period of not less than six months, a course of practical trainingin India in the mines and in a manner approved by the Chief Inspector for the purpose.

Beforethe commencement of his practical training in India as aforesaid, every person shall submit tothe Chief Inspector an application.

Provided further that the aforesaid requirement in regard to practical training may bedispensed within the case of a candidate who has had already obtained not less than six month's practical experience approved by the Board .

24. Suspension or cancellation of Manager's Certificate, Surveyor's Certificate, Overman's Certificate, Sirdar's Certificate, Engine Driver's Certificate or Gas Testing Certificate.-- (1) If the Regional Inspector is of the opinionthat the holder of a Manager's, Surveyor's, Overman's, Sirdar's, Engine-driver's, Shot-firer'sor Gas-testing Certificate is incompetent or is guilty of negligence or misconduct in theperformance of his duties under the Act or under these regulations, he shall bring the matterto the notice of the Board. The Board may authorise in writing an Inspector, not being and not below the rank of the Inspector whose report formed the basis of the said opinion, to hold an enquiry to determinewhether or not such a person (hereinafter referred to as the delinquent) is fit to continue tohold such certificate. The Board shall, before the beginning of the enquiry, furnish to thedelinquent a statement of the case on which the enquiry is instituted.

(2) During such enquiry the Inspector authorised to conduct the enquiry shall be provided withall relevant documents and he shall record :

(a) the evidence of any witness that formed the basis of the said opinion;

(b) any evidence that the delinquent may like to give;

(c) the evidence of any witness that the delinquent may like to produce;

(d) the evidence of Manager of the mine; and

(e) any other evidence that may be considered necessary or relevant by the Inspector conducting the enquiry.

Unless the delinquent fails to be present in spite of sufficient notice, the evidence aforesaid shall recorded in the presence of the delinquent and he shall be given a reasonable opportunity to cross-examine the witness (other than those produced by him). The Inspectorconducting the enquiry also may cross-examine the delinquent and the witnesses.

(3) The Inspector who conducted the enquiry shall, within fifteen days from the date of conclusion of his enquiry, send a report to the Board together with his findings, the notes of evidence recorded during the enquiry and other relevant records.

(4) Copies of the notes of evidence and the findings of the Inspector who conducted the enquiry shall also be sent to the delinquent who may submit his written representation to theBoard within thirty days from the date of despatch of such copies.

(5) The Board may, after considering the evidence and other records and the written representation, if any, submitted by the delinquent, either cause further enquiry to be made incase and thereupon, or otherwise, either exonerate the delinquent of the charges against himor suspend or cancel the certificate, as it deems fit.

(6) Against any order of the Board under this regulation, an appeal shall lie before Central Government within 30 days of the order.

25. Validity of certificate for managers and officials, etc.- (1) No person shall act as a manager oran official or a shot-firer or a winding engineman in a mine after attaining the age of 60 yearsunless he has obtained, within the preceding one year, a medical certificate of fitness certifying him fit to carry out the duties prescribed for him in the Act and in these regulationsand orders made thereunder:

Provided that if the Chief Inspector or the Regional Inspector is of the opinion that a person asaforesaid, though less than 60 years of age, is medically unfit to carry on the duties prescribed for him in the Act and in the regulations, and orders made thereunder, the Chief Inspector or the Regional Inspector may, by an order in writing, require such persons to obtain a medical certificate of fitness within such period, not exceeding three months, as he may specify therein; and no such persons shall continue to act in any capacity as aforesaid after the period so specified unless he has obtained a medical certificate of fitness.

(3) Notwithstanding anything contained in sub-regulation (1), no person shall act as manager or an official or a winding engineman in a mine after attaining the age of seventy years.

MULTIPLE CHOICE QUESTIONS

Examinations and Certificates of Competency and of Fitness

1. How many members are there in a Board of Mining Examination excluding Chief Inspector?
   a) 5
   b) 6
   c) 7
   d) 4
2. What is the tenure of office of members of Board of mining examinations except Chief Inspector?
   a) Two years
   b) Three years
   c) Four years
   d) Till retirement
3. How many members of board of mining examination including chairman are necessary to be present to execute a meeting?
   a) Three
   b) Four
   c) Five
   d) Two
4. How many types of certificate is granted by the board of mining examinations?
   a) 5
   b) 6
   c) 7
   d) 8
5. What is the minimum age to appear in any examinations conducted by DGMS?
   a) 23 years
   b) 20 years
   c) 25 years
   d) 18 years
6. Which of the following statement is false regarding qualifications necessary for a mining graduate engineer to appear in first class manager's certificate examination?
   a) He must be at least 20 years of age
   b) He must have total two years of practical experience after graduation
   c) He must have at least one year of practical experience after possessing second class certificate.
   d) None of the above is false

Answers

1.a 2.b 3.a 4.c 5.b 6.b

Inspector and Mine Officials

26. Qualifications of Inspectors –(2) No person shall be appointed as Inspector unless he holds a degree or diploma in mining engineering of an educational institutionapproved by the Central Government and also a First Class Manager's Certificate grantedunder these regulations:
Provided that –
(i) in relation to electrical machinery installed in mines, a persons holding a degree in electrical engineering of an educational institution approved by the CentralGovernment may be so appointed;
(ii) in relation to other machinery or mechanical appliances installed in mines, a personholding a degree in mechanical engineering of an educational institutionapproved by the Central Government may be so appointed; and
(iii) in relation to the provisions of the Act and of the rules and regulations which relate to matters concerning the health and welfare of perons, a person holding a degree in Bachelor of Medicines and Bachelor of Surgery (M.B.B.S.) or such other qualification as may be prescribed, of an educational institution approved by the Central Government or a person holding such other qualifications as the Central Government may approve in this behalf, may be so appointed.

Average output of any mine, means the average per month during thepreceding financial year of the total output from all excavations within the specified mine boundaries.

"Financial year" means a period of twelve months from the first day of April to the last day of March of the successive year.

27. Qualifications and appointment of managers – (1) No mine shall be opened, worked orre-opened unless there is a manager of the mine, being a person duly appointed and havingsuch qualifications as are required by these regulations.
(2) No person shall act or be employed as a manager unless he is 23 years of age.

FMC Exam'14
What shall be the minimum age of the person to become manager of a mine ?
a) 20
b) 23
c) 25
d) 40 Ans: (b) 23

If you are taking experience for the validation of manager's certificate. What should be the minimum production per month of that mine ?
a) 1000
b) 600
c) 20,000
d) 2500 Ans: (a) 1000

No person shall act or continue to act, or be appointed, as manager of a mine or mines unless he satisfies

Average output	Qualifications
For belowground mines: (a) In excess of 2,500 tonnes per month	A First Class Manager's Certificate not restricted to opencast mines only
(b) Notexceeding 2,500 tonnes per month.	A First Class Manager's Certificate or SecondClassManager's Certificate Notrestrictedtoopencast mines only.
	A First Class Manager's Certificate.
For opencast mines: (c) In excess of 21,000 cubic metre per months of material handled (d) Not exceeding 21,000 cubic metre material handled per month	A First Class Manager's Certificate or Second Class Manager's Certificate

Provided that in respect of a mine having both opencast and underground workings a personholding First Class Manager's Certificate not restricted to opencast mines shall only be appointed as themanager of the mine irrespective of production.

(4) Where a person holding a First Class Manager's Certificate or Second Class Manager's Certificate has been appointed as manager, a person holding lower qualifications shall not, except with the previous permission in writing of the Chief Inspector and subject to such conditions as he may specify therein, be so appointed during the succeeding twelve months, notwithstanding any reduction in the average output of the mine.

(5) No person shall act, or be appointed, as manager of more than one mine except with theprevious permission in writing of the Chief Inspector. No such permission shall have effect for a period **exceeding 12 months**,unless renewed.

(6) Where by any reason, the manager is unable to exercise his duty, the owner, agent or manager shall authorise inwriting a person whom he considers competent to act as manager of the mine:

Provided that –

(i) such person holds a Manager's Certificate;

(ii) no such authorisation shall have effect for a period in excess of 30 days, except withthe previous consent in writing of the Chief Inspector.

(iii) the owner, agent or manager, shall forthwith send by registeredpost to the Chief Inspector and the Regional Inspector a written notice intimating thatsuch an authorisation has been made, and stating the reason for the authorisation,the qualifications and experience of the person authorised, and the date of thecommencement and ending of the authorisation.

(7)(a) No manager shall vacate his office without giving due notice in writing to the owner oragent **at least 30 days** before the day on which he wishes to vacate his office.

(b)(a) The owner or agent shall provide suitable residential accommodation for the managerand the under-manager or assistant manager within a distance of five Kilometers, from allmine openings and every manager, assistant manager shall reside in theaccommodation so provided.

(10) No manager shall act as agent or assistant manager or in any other capacity in another mine.

(c) Except as hereinafter provided in sub-regulation (5), no manager shall act as manager or in any other capacity in another mine.

Safety problems in larger mines are more complicated and of larger magnitude. It is therefore recommended only such a person who has had ***not less than 5 years' experience*** *after obtaining the Manager's certificate should therefore be employed as manager of a mine which produces* ***20,000 te or more*** *of coal per month.*
(Cir. 8/1959)

22. Charge report of managers.- When there is a change of manager of any mine, the outgoing managershall hand over to the incoming manager, a charge report in Form I and the charge report shall be signed by both the outgoing andincoming managers and a copy of the charge report shall be sent to the Regional Inspector.

23. Qualifications and appointment of Safety Officers.–In every belowground mine the average monthly output of which exceeds 1,000 tonnes, or in every opencast mine the average monthly material handled of which exceeds 21,000 cubic metre, the manager shall be assisted in the work of promoting safe practices in the mine by a Safety Officerwho shall be a person holding the following qualifications:

Average Monthly Production	Qualification
In case of belowground mine (a) >15,000 tonnes per month	A First Class Manager's Certificate not restricted to opencast mines only
(b) 10,001-15,000 tonnes per month	A First or Second Class Manager's Certificate not restricted to opencast mines only
(c) 5,001-10,000 tonnes per month.	a First or Second Class Manager's Certificate not restricted to opencast mines oreither a degree or diploma in Mining or Mining Engineering.
In case of opencast mine >50,000 cubic meter per month	A First Class Manager's Certificate
20,000-50,000 cubic meter per month	a First or Second Class Manager's Certificate

30. Appointment of assistant managers – In every mine, the manager shall be assisted by assistant managers on the scale as may be specified by the Board.

31. Qualifications and appointment of ventilation officer; -In a **first degreegassy seams** where the average output of which **exceeds 5,000 tonnes** or of **second or third degree** the average output of which **exceeds 2,500 tonnes**, the manager shall be assisted by a ventilation officer who shall be a person holding the following qualifications:

(a) in **first degreeseam** having an average output in **excess of 15,000 tonnes** or a **second or third degreeseam**having an average output in **excess of 10,000 tonnes**, a **Manager's Certificate**; and

(b) in every other case, a Manager's Certificate or a Degree, Diploma or Certificate in Mining or Mining Engineering.

In the case of a **first degreemine** having an average output **less than 15,000 tonnes**, the **Regional Inspector** may combine the post of **ventilation officer with that of safety officer.**

Gassy seam of the first degree means a coal seam or part thereof lying within theprecincts of a mine not being an open cast working whether or not inflammable gas is actuallydetected in the general body of the air at any place in its workings below ground, or when thepercentage of the inflammable gas if and when detected, in such general body of air does notexceed 0.1 and the rat of emission of such gas does not exceed one cubic metre per tonneof coal produced;

Gassy seams of the second degree means coal seams or part thereof lying within theprecincts of a mine not being an open cast working in which the percentage of inflammablegas in the general body of air at any place in the workings of the seam is more than 0.1 or therate of emission of inflammable gas per tonne of coal produced exceeds one cubic metre butdoes not exceed ten cubic metres;

Gassy seams of the third degree means of coal seam or part thereof lying within theprecincts of a mine not being an open cast workings in which the rate of emission ofinflammable gas per tonne of coal produced exceeds ten cubic metres.

"coal" includes anthracite, bituminous coal, lignite, peat and any other form of carbonaceous matter sold or marketed as coal.

32. Appointment of engineers.– (1) At every mine where machinery is used, an engineer holding a degree or diploma in mechanical engineering, electrical engineering, mining machinery or equivalent qualification as may be recognised by the Central Government, shall be appointed to hold general charge of such machinery, and to be responsible for its installation, maintenance and safe working, who shall besubordinate to manager:

Provided that where electrical energy exceeding 650 volts is used and the installed capacity of allelectrical equipment is 1.5 MVA and above, an engineer holding a degree or diploma in electricalengineering or equivalent qualification as may be recognised by the Central Government, shall beappointed to hold charge of all the electrical equipment installed at the mine in addition to that specified above:

Provided further that in case of opencast mines worked by heavy earth moving machinery or in anymechanised mine having belowground workings, in which the aggregate horse power of all the machinery used exceeds 1500, a person holding a degree or diploma in mechanical engineering, mining machinery or equivalent qualification as may be recognised by the Central Government, shall also be appointed to hold charge of all the mechanical equipment installed at the mine in addition to that specified above:

Provided also that nothing in this sub-regulation shall be deemed to prohibit the employment oftwo or more engineers at one mine so long as the jurisdiction and sphere of responsibility of every suchengineer is defined by the manager in writing.

(3)No person shall act, or be appointed, as engineer of more than one mine except with the previouspermission in writing of the Chief Inspector .

Provided that no such permission shall have effect for a period exceeding twelve months, unless renewed.

(4) Where by reason of temporary absence by any cause, the engineer, appointed is unable to perform his duties, the manager shall authorise in writing a person whom he considers competent to act in his place:

Provided that –

(a) notice of every such authorisation shall be sent to the Regional Inspector forthwith;

(b) no such authorisation shall have effect for a period in excess of thirty days except with theprevious written consent of the Regional Inspector and subject to such conditions as he mayspecify therein; and

(c) the Regional Inspector may by an order in writing, revoke any authority so granted.

Size of Overman's District

Size of overman's district may be determined on the following principles-

(1) The size of overman's district shall be so arranged that :

a) Number of persons of all categories under the charge of the overman does not exceed 100.

b) Distance between the first and last working face is ordinarily not more than 750m measured along the inspection route(but not taking into consideration the travelling done beyond the last ventilation connection for inspecting blind heads) ;

Provided that when the thickness of the seam is less than 1.5m or when the workings are steeper than 1 in 5 ,the said distance may be limited to 450m; and

c) the output of the district is not more than 100 te per shift.

Provided that if part of the output is from depillaring area, the saidlimit of output may be increased to 125 te.

(2) The criteria given in (1) above will not apply to –

a) A longwall face, which should be under the charge of one overman only in each shift irrespective of the output and number of men employed at the face; and

b) For the mines in Assam overman's district shall be determined in consultation with the Regional Inspector.

(Cir. 48/1966)

33. Appointment and qualifications of senior officials – (1) At every mine, one or moreoverman shall be appointed to hold charge of the different districts of the mine on eachworking shift.

(3) Every person employed as an official subordinate to the manager and superior to theSirdar shall hold either a Manager's Certificate or an Overman's Certificate.

34. Appointment of surveyors.– (1) At every mine, one or more persons holding a Surveyor's Certificate shall be appointed to be the surveyor for carrying out the surveys and levellings and for preparing the plans and sections required under the Act or the regulations, or orders made thereunder.

Provided that in case of mines having opencast workings only, nothing in this sub-regulation shall prohibit the appoint of one or more persons holding a Surveyor's Certificate restricted to opencast mines only for carrying out the surveys and levellings and for preparing the plans and sections required under the Act or the regulations, or orders made thereunder.

(2) No person shall be appointed as a surveyor of more than one mine or in any other capacity in the same mine, without the previous permission in writing of the Chief Inspector and subject to such conditions as may be specified therein.

(3) The number of surveyors required to be appointed shall be on the scale as may be specified by the Board.

Provided that in specific cases, the Chief Inspector may relax the requirement of the appointment of surveyors.

(4) If a mine has more than one surveyor, each shall carry the duties and the responsibilities of the surveyor for the part or section of the mine to be assigned in writing by the owner, agent or manager.

Provided that the owner, agent or manager shall appoint one of the surveyors to be responsible for the preparation and maintenance of the plans required to be prepared and maintained under these regulations who shall also be responsible for co-ordination and overall supervision of survey work in the mine.

Where more than one surveyor are appointed than surveyor who prepares a plan is responsible for its accuracy and must sign the plans sections and tracing prepared by him.

(Cir. Tech. 3/1979)

35. Appointment of Officials and competent persons – (1)(a) The owner, agent or manager shall appointsuch number of competent persons, including officials and technicians as is sufficient to secure, duringeach of the working shifts –

(i) adequate inspection of the mine and the equipment thereof;

(ii) a thorough supervision of all operations in the mine;

(iii) the installation, running and maintenance, in safe working order, of all machinery in the mine.

(2) It shall be the responsibility of the manager to see that the persons so appointed are competent toperform the duties assigned to them. No person shall be so appointed unless he is paid by the owner oragent and is answerable to the manager.

(3) Copies of all appointments such shall be entered in a boundpaged book kept for the purpose.

"Competent person" *in relation to any work or any machinery, plant or equipment meansa person who has attained the age of 20 years and who has been duly appointed inwriting by manager as a person competent to supervise or perform that work, or tosupervise the operation of that machinery, plant or equipment, and who is responsible forthe duties assigned to him, and includes a shotfirer.*

MULTIPLE CHOICE QUESTIONS

Inspector & Mine Official

1. What is the required minimum age for becoming a manager of a mine?
   - a) 25 year
   - b) 23 year
   - c) 20 year
   - d) 30 year
2. A belowground mine having average monthly output 5000tonne shall be under a manager having qualification____________?
   - a) Degree in mining
   - b) Diploma in mining
   - c) First class manager's certificate
   - d) Second class manager's certificate
3. A mine can be worked without manager for ________
   - a) A shift
   - b) One day
   - c) 3 days
   - d) None
4. A person can be appointed as manager of more than one mine by the permission of_________?
   - a) CI
   - b) RI
   - c) CI or RI
   - d) DM & CI
5. A person can act as a manager for two mines for a period not exceeding_______, unless renewed.
   - a) 6 months
   - b) 12 months
   - c) 24 months
   - d) 3 months
6. A mine's monthly average production is 10000 tonne. How many surveyors are required there ?
   - a) 1
   - b) 2
   - c) 3
   - d) 4

7. A person is authorized to act as manager of mine in absent of manager of mine. Such authorization shall be valid for period not exceeding______.
   - a) 12 months
   - b) 6 months
   - c) 24 months
   - d) 30 days
8. Before vacating his office manager shall give notice to owner or agent at least_____ before the day on which he wishes to vacate his office.
   - a) 30 days
   - b) 15 days
   - c) 7 days
   - d) 3 days
9. Which of the following post can a manager hold in another mine?
   - a) Agent
   - b) Assistant manager
   - c) Safety officer
   - d) None
10. A person having First class manager's certificate was appointed as safety officer of a mine. Average monthly output of such mine may be__________
    - a) 10,000 tonne
    - b) 5500 tonne
    - c) 15000 tonne
    - d) All
11. A mine having monthly average production of 20000 tonne. Safety officer of such mine must have__________.
    - a) First class manager's certificate
    - b) Second class manager's certificate
    - c) Degree in mining
    - d) Diploma in mining
12. A person having Second class manager's certificate was appointed as safety officer of a mine. Average monthly production of such mine may be_______.
    - a) 5500 tonne
    - b) 12000 tonne
    - c) 10000 tonne
    - d) All
13. A mine must have safety officer holding Second class manager's certificate when production of such mine exceeds?
    - a) 10000 tonne monthly
    - b) 10000 tonne yearly
    - c) 15000 tonne monthly

d) 15000 tonne yearly

14. A degree or diploma in mining engineering can be appointed as safety officer when production of such mine is_________?

a) 20000 tonne/month
b) 15000 tonne/month
c) 6000tonne/month
d) 12000 tonne/month

15. In a first degree gassy seam, manager shall be assisted by ventilation officer when the average monthly production of mine exceeds_____?

a) 5000 tonne
b) 2500 tonne
c) 7000 tonne
d) 10000 tonne

16. In case of second degree gassy seam , ventilation officer shall possess manager's certificate when production of that mine exceeds_________.

a) 15000 tonne/month
b) 10000 tonne/month
c) 5000tonne/month
d) 2500 tonne/month

17. A person having degree in mining engineering was appointed as ventilation officer in first degree gassy seam mine. Average monthly production of that mine may be

a) 15000 tonne
b) 16000tonne
c) 15500tonne
d) 20000 tonne

18. In a first degree mine, Regional inspector has combined the post of ventilation officer with that of safety officer. The average monthly production of such mine may be________.

a) 5000 tonne
b) 20000 tonne
c) 15500 tonne
d) 16000 tonne

19. Competent person means a person who has attained the age of _______.

a) 16 year
b) 18 year
c) 20 year
d) 23 year

Answers

1.b 2.c 3.d 4.a 5.b 6.b 7.d 8.a 9.d 10.d 11.a 12.d 13.a
14.c 15.a 16.b 17.b 18.a 19.c

Duties and Responsibilities of Workmen,Competent Persons and Officials

37. Duties and responsibilities of owner.– (1) In taking preventive and protective measures, the owner shall arrange for regular assessment of the risk and dealing with it in the following order of priority:-

(a)eliminate the risk;

(b)control the risk at source;

(c)minimize the risk that include the design of safe work systems; and

(d)in so far as the risk remains, provide for the use of personal protective equipment, having regard to what is reasonable, practicable and feasible, and to good practice and the exercise of due diligence.

(2)Owners shall take all necessary measures to eliminate or minimize the risks to safety and health of persons employed in mines under their control and shall-

(a)ensure that the mine is designed, constructed and provided with electrical, mechanical and other equipment, including a communication system, to provide conditions for safe operation and a healthy working environment;

(b)ensure that the machine is commissioned, operated, maintained and de-commissioned in such a way that workers can perform the work assigned to them without endangering their safety and health or that of other persons;

(c)take steps to maintain the stability of the ground in which persons have access in the context of their work;

(d)where practicable, provide from every underground workplace, two exits each of which is connected to separate means of egress to the surface;

(e) ensure the monitoring, assessment and regular inspection of the working environment to identify the various hazards to which the workers may be exposed and to assess their level of exposure;

(f)ensure adequate ventilation for all underground working to which access is permitted;

(g)in respect of zones susceptible to particular hazards, draw up and implement an operating planand procedures to ensure a safe system of work and the protection of workers;

(h)take measures and precautions appropriate to the nature of a mine operation to prevent, detect and combat the start and spread of fires, explosions and inundations;

(i)ensure that, when there is serious danger to the safety and health of workers, operations are stopped and workers are evacuated to a safe location;

(j)ensure that corrective actions are taken immediately, when manager or other officials report non-compliance with safety and health regulations or code of practice by any person.

(3) The owner shall ensure preparation of an emergency response plan specific to each mine for reasonably foreseeable industrial and natural disasters.

(4) Where workers are exposed to physical, chemical or biological hazards, the owner shall-

(a)inform the workers, in a comprehensible manner, of the hazards associated with their work, the health risks involved and relevant preventive and protective measures;

(b)take appropriate measures to eliminate or minimize the risks resulting from exposure to those hazards;

(c)where adequate protection against risks of accident or injury to health including exposure to adverse conditions is not possible to be ensured by other means, provide and maintain at no cost to the worker, suitable protective equipment, clothing as necessary and other facilities as defined by these regulations;

(d)provide workers who have suffered from an injury or illness at the workplace with first aid,appropriate transportation from the workplace and access to appropriate medical facilities.

(5) The owner shall ensure that-

(a)adequate training and re-training programs and comprehensible instructions are provided forworkers, at no cost to them, on safety and health matters as well as on the work assigned;

(b)adequate supervision and control are provided in each shift to secure the safe operation of themine;

(c)a system is established so that the names of all persons who are employed belowground can beaccurately known at any time, as well as their probable location;

(d)all accidents and dangerous occurrences are investigated and appropriate remedial actions aretaken;

(e)the reporting of information and notices specified under regulation 8 is made to the RegionalInspector and to the Chief Inspector on accidents and dangerous occurrences.

(6) The owner shall ensure regular health surveillance of workers exposed to occupational health hazardsspecific to mining operations.

38. Generalresponsibilities ofsupplier,manufacturer and designer.- A person who designs,manufactures, imports, provides or transfers machinery, equipment or substances for use in coal mines,shall -

(a)ensure that the machinery, equipment or substances do not entail dangers for the safety andhealth of those using them correctly;

(b)make available-

(i)information concerning their requirement for the correct installation, maintenance anduse of machinery and equipment and the correct storage and use of substances;

(ii)information concerning the hazards of machinery and equipment, the dangerous properties of hazardous substances and physical agents or products; and

(iii)information on how to eliminate or control risks arising from the identified hazardsassociated with the products.

"manufacturer" means an individual, association of individuals, company or institution who manufactures machinery, plant, equipment, appliance or substances for use in coal mines.

39. Responsibilities of contractor.– (1) A contractor deployed in a mine for any work shall-(a)establish effective ongoing communication and co-ordination between appropriate levels ofsupervisors, officials, senior officials of the mine prior to

commencing work, which shallinclude provisions for identifying hazards and the measures to eliminate and control risks.

(b)ensure arrangements for reporting work related injuries and diseases, ill health and incidentsamong his workers while performing work inthe mine;

(c)provide relevant workplace safety and health hazards awareness and training to their workersprior to commencing and as work progresses as necessary; and

(d)ensure compliance of the provisions of the Act, and the rules and regulations framedthereunder.

(2) When deploying contractors, the owner, agent and manager shall ensure that:

(a)the same safety and training requirements apply to the contractors and their workers as to theworkers of the establishment;

(b)where required, only such contractors are deployed that have been duly registered or holdlicenses; and

(c)the contract specify safety and health requirements as well as sanctions and penalties in case ofnon-compliance and such contract shall include the right for mine officials to stop the workwhenever a risk of serious injury is apparent and to suspend operations until the necessaryremedies have been put in place.

"contractor" means an individual, association of individuals, company, firm, local authority or local body who provides for the services or operations in a mine on contract basis, and includes a sub-contractor.

"designer" means an individual, association of individuals, company or institution who designs a coal mining system, method of coal mining, machinery, plant, equipment, appliance or substances for use in coal mines;

43. Duties and responsibilities of manager.-(1)(a) In every mine daily personal supervisionshall be exercised by the manager; and in case of workings belowground, he shall visit andexamine the workings belowground on at least four days in every week to see that safety inevery respect is ensured. Of these inspections one at least in every fortnight shall be madeduring the night shift.

(3) The manager shall make arrangements for all overmen and other officials to meet him or the assistant manager once in every working day for the purpose of conferring on them matters connected with their duties.

(4) The manager shall ensure sufficient supply of proper materials and appliances for the safety of the mine and the persons employed therein; and if he be not the owner or agent of the mine, shall report in writing to the owner or agent, when anything is required for the aforesaid purpose that is not within the scope of his authority to order, and a copy of every such report shall be recorded in a bound-paged book kept for the purpose..

(4) The manager shall assign to every competent his particular duties.

(7) The manager shall provide every overman with a tracing, upto the date of the last survey, showing the workings of the district belowground assigned to him and such tracing shall, where any work of reduction or extraction of pillars is being carried

out, show clearly the reference of the permission and the manner in which such reduction or extraction is to be carried out: Provided that in case of opencast mines, such tracing shall also show the sections of the working under his charge

(10) When there occurs in a mine any accident resulting in serious bodily injury or loss of life to any person or any dangerous occurrence, as specified under clause (b) of sub-regulation (1) of regulation 8, the manager shall, as soon as possible, inspect the site of the accident or the dangerous occurrence, as the case may be,and shall also,either himself or through an assistant manager, have an inquiry made into the cause and circumstances attending the same and the result of every such enquiry along with a plan and sections and, wherever practicable, a photograph or photographs of the site of the accident or dangerous occurrence showing details, shall be recorded in a bound paged book kept for the purpose and acopy thereof shall befurnished to the Chief Inspector and Regional Inspector within fifteen days of the accident .

(11) The manager shall perform such other duties as have been prescribed in that behalf under the provisions of the Act, the regulations or orders made thereunder.

(12) The manger may suspend or take such disciplinary action against any employee for contravention of

any of the provisions of the Act or the regulations and orders made thereunder.

44. Duties of Safety Officers – (1) The duties of the Safety Officer shall be :

(ii) to take charge of the newly recruited staff and show them around the mine pointing out thesafe and unsafe acts during the course of their work in the mine;

(b)(i) to investigate all types of accidents and incidents in the mine including minor accidents;to analyze the same with a view to pinpointing the nature and common cause of accidents inthe mine.

(iii) to study and apprise the manager of all possible sources of danger such as inundation,fire, coal dust and others;

(c)(i) to hold safety classes and give safety talks and lectures to the members fo the supervisory staff;

(ii) to organise safety weeks and other safety education and propaganda in mine;

(d) to see that all concerned mine employees are fully conversant with various standingorders (such as those relating to stoppage of mine mechanical ventilators and to theoccurrence of a fire or other emergency in the mine) and Systematic Timbering Rules;

(e) to provide assistance in the formulation of programme for training at the mine level;including vocational training, training in gas-testing, and training in First Aid;

(f) to report to the manger as a result of his visits to the various arts of the mine, as to whetherthe provisions of the Mines Act, Regulations and Rules made thereunder are being compliedwith in the mine;

(g) to promote safety practices generally and to lend active support to all measures intendedfor furthering the cause of safety in the mine; and

(h) to assist the manager in any other matter relating to safety in the mine.

(2)The safety officer shall ensure that an appropriate emergency plan as required under these regulations is put in place and the requirements of the same are implemented.

(3) Except in an emergency no duties other than those specified above shall be assigned to the Safety Officer and whenever any duties other than those specified above are assigned tothe Safety Officer by the manager, a written notice thereof shall be sent to the RegionalInspector within three days of such assignment.

45. Duties and responsibilities of assistant mangers – (1) The assistant manager shall carry out the duties assigned to him by themanager.

(2) The assistant manager shall, subject to the orders of the manager, visitand examine the workings under his charge, or part thereof, on every working day.

(3) The assistant manager shall, from time to time, carefully examine everytravelable part of the mine or part thereof placed under his charge, whether frequented byworkpersons or not.

(4) In the absence of the manager, the assistant manager shall have thesame responsibility, discharge the same duties and be subject to the same liabilities as themanager, but not so as to exempt the manager therefrom.

(5)The assistant manager shall, in a bound paged book kept for the purpose, record the result of each
of his inspections and also the action taken by him to rectify the defects noticed, if any.

46. Duties of Ventilation Officer – The Ventilation Officer shall –

(a)(i) ensure the observances of all regulations and orders concerning ventilation, gas andcoal dust including dust suppression and shall advise the manager if any alteration is requiredin the ventilation system to ensure adequacy of ventilation in compliance with the regulationsor orders;

(ii) advise the manager on day to day problems of ventilation, gas and coal dust;

(iii) maintain close liaison with the undermanagers and other supervisory staff, and assistthem in their day-to-day ventilation problems.

(b)(i) carry out ventilation surveys of the mine and undertake any other special work relatingthere to as may be directed by the manager from time to time;

(ii) take such steps as are necessary to ensure compliance with the ventilation standardsrequired in terms of these regulations or otherwise;

(c)(i) check the speed of the main mechanical ventilator, amperage drawn by its electricmotor, and **fan drift water gauge at least once in a day**.Any unusual change in the watergauge shall be investigated by him and reported to the manager

(ii) determine the efficiency of the main mechanical ventilator once at least in every threemonths.

Extra Shots

$$\text{ventilation efficiency quotient} = \frac{\text{Quantity of air in last ventilation connection}}{\text{Quantity of air entered in district}} \times 100$$

(d) ensure the correct siting and installation of auxiliary and booster fans underground;

(e) examine at frequent intervals all ventilation appliances like doors, brattices, air crossings,regulators, stoppings, booster and auxiliary fans, ventilation ductings and other devices ofventilation control in the mine and report any defect in the same to the manager.

(f) see that sufficient quantity of good air is coursed into all working places and reaches allother workings belowground.

(g)(i) maintain separate tracing of the ventilation, rescue, stone dusting and the dust samplingplans and bring them up-to-date;

(ii) bring to the notice of surveyor any changes in the ventilation system or ventilationappliances and shall see that all old markings on the ventilation and rescue plans arecorrected and new ventilation circuits are shown forthwith.

(h) regularly check the barometer provided at the mine. Any unusual change in barometerpressure shall be reported by him to the manager;

(k) regularly visit returns of working districts and old workings including fire stoppings, ifnecessary, for symptoms of spontaneous heatings and fire.

(l) ensure that sufficient quantity of good air is coursed into all working places and reaches all workings belowground, and for this purpose, shall –

(i) see that the ventilation stoppings, brattices, etc., are constructed as per specifications and are kept extended sufficiently;

(ii) see that measurements of air quantity, temperature and humidity are regularly taken as specified and bring up-to-date the entries on the check boards provided at each air measurement station;

(iii) determine the Ventilation Efficiency Quotient (VEQ);

(iv) see that mine air samples are properly collected at the appointed time and place, and analysed within forty-eight hours of taking thereof; and (v) make observations for inflammable and any other harmful gases;

(m) (i) take necessary steps for proper cleaning, treatment and suppression of coal dust in themine and see that the arrangements for wetcutting at the faces and water spraying at andwithin 90 m of the working places are properly installed and function satisfactorily.

(ii) see that the stone dust barriers are correctly sited, properly constructed and bring maintained inaccordance with the statutory requirements or otherwise; and bring the entries on the checkboards up-to-date from time to time;

(iii) see that samples of mine roadway dust and of airborne dust samples (if required by themanager) are regularly taken in the prescribed manner;

(n) collect air samples from sealed off areas, exhaust gases from diesel vehicles and fromsuch other places as may be required by the manager;

(2) Except in an emergency no duties other than tose specified above shall be assigned tothe ventilation officer and whenever] any duties other than those specified above areassigned to the ventilation officer by the manager, a written notice thereof shall be sent to theRegional Inspector within three days of such assignment.

working place means any place in a mine to which any person has lawful access.

47. Duties and responsibilities of overman – The overman shall strictly observe the followingprovisions, namely –

(1) (a) Subject to the orders of superior officials, he shall have responsible charge andcontrol of such part of the mine, and shall carry out such duties, as may be assigned tohim by the manager.

(b) He shall, while on duty, carry a tracing of the workings of such district and shall keep thetracing up-to-date.

(d) He shall be responsible to see that the subordinate officials and competent persons in hisdistrict carry out their respective duties in a proper manner.

(3) (a) He shall see that every air-crossing, stopping, door, brattice and other ventilationdevice is maintained in good order.

(b) He shall, in his district, see that the ventilation is effective.

(c) He shall have power to send out of the mine any person under his charge infringing orattempting to infringe any provision of the Act or of the regulations or orders madethereunder, or failing to carry out any direction given with regard to safety; and shall report inwriting any such infringement or attempted infringement or failure to the manager.

(4)(a) He shall see that all tracks and tramlines are properly laid, graded, ballasted o(b) He shall see that the manholes on the haulage roadways are kept safe, clear of anyobstruction, and properly white-washed.

(c) He shall see that the safety devices are fixed andused as required under the regulations.

(d) He shall, if he finds any of the apparatus in use in his district to be in an unsafe condition, stop the use of the same forthwith.

(5) He shall be responsible to see that except for the purpose of inspection, examination andrepairs every person other than an official or a haulage attendant travels by the travellingroadway.

In case of opencast workings, the overman shall ensure that-

(a)sides of benches are kept properly dressed;

(b)stability of benches is not endangered;

(c)haul roads are kept maintained;

(d)stability of overburden dumps is not endangered;

(e)there is no over-crowding of men and machinery at the working faces;

(f)adequate lighting is provided at the area under his control; and

(g)adequate precautions as laid down in these regulations are taken before blasting operations is conducted;

(h)all machinery and plant are operated in safe and secured manner.

(6) He shall give prompt attention to the removal of any danger observed or reported to him,and shall see that dangerous places are adequately fenced off.

48. Duties and responsibilities of sirdar.– The Sirdar or other competent person appointedshall strictly observe the following provisions, namely –

(1)(a) Subject to orders of superior officials, he shall have responsible charge and control ofthe district of the mine assigned to him by the manager or the under-manager or assistantmanager.

(3)He shall see that the roof and sides of all travelling roadways to, and working places in,his district are made and kept secure.

(4) Where either of the two ways affording means of egress from the district to the surface isnot ordinarily used for travelling, he shall travel, once at least in every seven days, the wholeof such way in order to make himself thoroughly acquainted with the same.

In case of opencast workings, the sirdar shall ensure that-

(a)sides of benches are kept properly dressed;

(b)stability of benches is not endangered;

(c)haul roads are kept maintained;

(d)stability of overburden dumps is not endangered; and

(e)dust control measures are implemented.

(6)(a) If he observes any dangerous place during the course of his inspections or if anydanger at a place where workpersons are employed is reported to him, he shall, if the dangercannot be removed forthwith withdraw all persons from such place and shall not leave theplace until the danger has been removed in his presence or all approaches to the place havebeen fenced off so as to prevent persons from inadvertently entering such place.

(b) He shall take care that any dangerous operation is carried out with due precaution, and insuch cases shall be present throughout whenever any work of clearing falls of ground andsetting of supports therein is being carried out.

(d) If he finds any accumulation of inflammable or noxious gases, he shall carry out theprovisions of regulations 142 and shall not remove such accumulation until he has receivedinstructions in that behalf from his superior official.

(7) He shall, on receipt of information of an accident to any person in his district, proceed atonce to the place of accident, inspect the place and, if reuqired, supervise the rescueoperations, and shall report or send notice of the accident to the manager or undermanageror assistant manager.

53. Duties and responsibilities of surveyors – (2) The surveyor shall record in abound-paged book kept for the purpose the full facts when workings ofthe mine have approached to about 120 metres from themine boundary, or from disused or waterlogged workings.

where in any mine two or more surveyors are employed, each of the surveyors shall make the entries aforesaid in respect of the workings in his jurisdiction or ofthe plans and sections in his charge.

Face means the moving front of any working place or the inbye end of any gallery, roadway or drift.

***Disused working** means such working in a mine where work has been temporarilystopped due to some reasons but which are accessible and include unused working.*

MULTIPLE CHOICE QUESTIONS

Duties & Responsibilities of Workmen , Competent Person etc.

1. At what interval ventilation officer shall determine the efficiency of main mechanical ventilator?
   a) 7 days
   b) 3days
   c) 15days
   d) 3 months
2. Whose duty is to see that sufficient supply of materials & appliances for carrying out mine working as per legislation are available at mine?
   a) Safety officer
   b) Manager
   c) Overman
   d) Owner
3. Whose duty is to investigate the accidents occurred in mine ?
   a) Safety officer
   b) Assistant manager
   c) Ventilation officer
   d) Manager
4. Whenever any other duty is assigned to safety officer, a notice has to be sent to regional inspector within __________ of such assignment?
   a) 7 days
   b) 14days
   c) 3days
   d) Immediately
5. Whose duty is to examine travel part of mine?
   a) Overman
   b) Assistant manager
   c) Competent person
   d) Safety officer

Answers

1.d 2.b 3.a 4.c 5.b

Plans and Sections

64. General requirements about mine plans –(1) Every plan or section prepared or submittedin accordance with the provisions of the regulations shall –

(a) show the name of the mine and of the owner, and the purpose for which the plan isprepared;

(b) show the true north, or the magnetic meridian and the date of the latter;

(c) show a scale of the plan at least 25 centimeters long and suitably subdivided;

(d) unless otherwise provided, be on a scale having a representative factor of 2000:1 or 1000:1

(e) be properly inked in on durable paper, tracing cloth **or on polyester film** and be kept in good condition

(f)have an abstract of all statutory restrictions in respect of any specified working with areference.

(3) The plans and sections required by these regulations shall be accurate within such limits of error as follows.

Specification Of Limits of Error

1.0 Plans

1.1 Accuracy of Correlation with Survey of India National Grid The positions of the surface reference stations and the centres of all mine shafts at the surface and reference points of underground surveys stations and also the boundaries of the mine and all surface features required to be shown shall be shown upon the key and Master plans in their correct positions relative to the Survey of India National Grid within the limits of error of survey and plotting as specified hereinafter.

Plans	
Plotting errors	
Plans on 1/2000 scale	50 cm
Plans on 1/1000 scale	25 cm
Plans on 1/200 scale	5 cm
Surface Surveys	
(i) Triangulation Position of stations of the triangulation as determined from initial and verification bases	1/5000th of linear horizontal distance of local point from the point of origin
(ii) Traverses Total angular error	$30\sqrt{n}$ seconds, where x is the least count of the instrument and n, the no. of observing stations
Total angular error	1/3000th of horizontal length of the traverse.
Underground Surveys	
(i) Traverse closed polygonally Total angular error	$(20+x)\sqrt{n}$ seconds, where x is the least count of the instrument and n, the no. of observing stations
Total angular error	1/2500th of horizontal length of the traverse
(ii) Traverse not closed polygonally but closed upon reference points Error of Closure	1/5000th of horizontal length of the traverse
(iii) Subsidiary surveys Error of closure by plotting	1/5000th of horizontal length of the traverse
Difference of two or more determinations of any subsidiary points	3 meters
Correlations	
By shaft wire By magnetic observations By direct connections	2 minute of arc 2 minute of arc 1 minute of arc
Levels	
Surface mine benches Inset bench marks	2cms per km. Two or more shaft measurements of established inset bench mark should agree within 1/5000.
Inbye bench marks	1/2500th of the inclined length of leveling
Subsidiary points	50 cm .

(4) The plans and sections required by the regulations shall be accurate and maintainedcorrected upto a date which is **not earlier that three months** .

Provided that where any mine or seam or section is proposed to be abandoned, closed or the working thereof to be discontinued or rendered inaccessible, the plan and section shall be brought up-to- date before such abandonment, closure or at the time of discontinuance, as the case may be, unless such abandonment, closure or discontinuance has been caused by circumstances beyond the control of the owner, agent or manager, in which case the fact that the plan or section is not up-to-date shall be recorded on it.

(5) All the reference stations at surface and the reference points of underground surveys shall be shown in their correct position relative to the survey of India national grid within the limits of error of survey and plotting, as specified in above table.

(6) Plans and sections shall be keptfor inspection in the office at the mine, and shall not be removed therefromexcept by or with the approval in writing of the Regional Inspector, unless a true copythereof has been kept therein.

All coal mines are required to prepare and maintain all new and reconstructed mine plans on a standard metric scale having representative factor of 2000:1 or 1000:1. (Cir. Legis. 2/1981)

65. Type of plans –(1) The owner, agent or manager of every mine shall keep the followingplans and sections :

(a) A surface plan showing every surface feature within the boundaries, such as telephone,telegraph or power transmission line, watermain, tram-line, railway, road, river,watercourse, reservoir, tank, bore-hole, shaft and incline opening, opencast working,subsidence and building on the surface.

(b) An underground plan showing :

(i) the position of the workings of the mine belowground;

(ii) every bore-hole and shaft with depth, incline opening, crossmeasure drift, goaf, fire-stopping or seal, water-dam (with dimensions and other particulars ofconstruction), pumping station and haulage roadway;

(iii) every important surface feature within the boundaries, such as railway, road, river, stream, watercourse, tank, reservoir, opencast working and building which is within 200 m of any part of the workings measured on the horizontalplane;

(iv) the general direction and rate of dip of the strata;

(v) such sections of the seam as may be necessary to show any substantial variation in the thickness or character thereof and showing the working section, and such sections of the strata sunk or driven through in the mine or proved by boring as may be available;

(vi) the position of every roll, washout, dyke and every fault with the amount and direction of its throw and hade;

(vii) an abstract of all statutory restrictions in respect of any specified workings with areferred to the order imposing the same.

Whatever this plan is brought up-to-date the then position of the workings shall be shown bydotted line drawn through the ends of the workings and such dotted line shall be marked withthe date of the last survey.

(c) where a seam has an average inclination of more than thirty degrees from the horizontal, one or more vertical mine section or sections, as may be required by Regional Inspector, showing a vertical projection of the mine working:

Provided that in case of a mine having opencast workings , vertical mine sections showing vertical projections of mine workings at suitable intervals not exceeding 100 m, in both, longitudinal as well as transverse directions, shall be prepared and maintained irrespective of the inclination of coal seam;

(d) A ventilation plan, and section where necessary, showing the system of ventilation in themine, and in particular –

(i) the general direction of air-current;

(ii) every point where the quantity of air is measured;

(iii) every air-crossing, ventilation door, stopping and every other principle device forthe regulation and distribution of air;

(iv) every fire-stopping and its serial number;

(v) every room used for storing inflammable material;

(vi) the position of fire-fighting equipment;

(vii) every water-dam with dimensions and other particulars of construction;

(viii) every pumping, telephone and ambulance station; and

(ix) every haulage and travelling roadway.

(x)every auxiliary or booster fan;

(xi)every stone dust barrier;

(e) **Joint survey plan** showing the details required under clause (b) of this sub-regulation andsub-regulations (6) and (7), signed by the surveyor and the manager of the mine and also ofadjoining mines having working within 60 meters of the common boundary or where theboundary is in dispute, within 60 meters of the boundary claimed by the owner of the mineconcerned signifying the correctness of the common boundary, or the disputed boundaries, asthe case may be, and of the position of the working in relation to one another.

(f) a geological plan of the area of leasehold, on a suitable scale.

Mine Geological plan *may be maintained at a scale having a representative factor of* ***5000:1.***
(Cir. 65/1964)

(g)**Water-danger plan** and section showing-

(i)nullah, river, lake, water pond, water coarse, drainage or any other water bodies onsurface or belowground existing upto 200 meters of the boundary of the mine;

(ii)the position of the working belowground and every borehole and shaft (with depth),drive, cross-cut, staple pit, excavation and air passage connected therewith;

(iii)the position of every dyke, fault and other geological disturbance with the amount anddirection of its throw as well as hade;

(iv)levels taken in workings belowground at easily identifiable points sufficient in numberto allow the construction of sections along all drives, main headings and haulageroadways;

(v)every source of water such as river, stream, water-course, reservoir, water-loggedopencast working on the surface, and also the outline of all water-logged workingsbelowground lying within 60 meters of any part of the workings measured in anydirection;

(vi)every reservoir, dam or other structure, either above or belowground, constructed towithstand a pressure of water or to control inrush of water, along with reference to itsdesign and other details of construction; and

(vii)the highest flood level of the area.

Goaf *means any part of workings below ground wherefrom a pillar or part thereof, or in the case of "longwall" workings, coal has been extracted but which is not a working place.*

River *means any stream or current of water, whether seasonal or perennial, and includes its banks extending up to the highest known flood level.*

(2)In case of working in contiguous seam combined plans shall be maintained and workings in different seams orsections shall be shown in different colours.

(3)(a)Surface and underground plan shall also show surface contour lines drawn at vertical intervals not exceeding five meters (or ten meters in the case of a mine where there are no working belowground or in cases of mines situated in hilly terrain, such other interval as the Regional Inspector may permit by an order in writing and subject to such conditions as he may specify) over the whole area lying within 200 meters of any part of the working

(b)Underground plan shall also show **spot levels** on the floor of the workings-

(i) **along all haulage roadways**, at every roadway junction, except in roadways wheretramming is done by manual means where the spot levels may be shown at pointsnot **more than 150 m apart**; and

(ii) in the case of headings which have been discontinued either temporarily or permanently, also at the **end of such headings**.

4(a)(i) Surface and underground plan shall also show thesettled boundary of the mine, or where the boundary is in dispute, the boundaries claimed bythe owner of the mine and by the owners of the mines adjacent to the disputed boundary:

Provided that where it is not possible to show the complete boundary of leasehold on thesame plan, an additional key plan or any other suitable scale showing such boundaries andthe outline of the workings shall also be maintained.

(ii) Underground plan shall also show theworkings, and all features as prescribed in that clause, both above and belowground of alladjacent mines as are situated within 60 m, measured on any plane, of the boundaryclaimed by the owners of the mines.

(b) The owner, agent and manager of every mine shall as soon as its workings extend towithin 60 m of the settled boundary with an adjacement (or where the boundary is indispute within 60 m of the boundary claimed by the owner of the adjacent mine)inform the owner, agent or manager of such mine of the fact of such extension and shallalso give all reasonable facilities to the surveyors of its adjacent mines to carry out thesurveys and levellings required to be made under this sub-regulation.

Measures to give warning of Danger of Inundation

- It is one of the important statutory duties and responsibility of surveyor to record in a bound book ' the full facts when working of the mine have approached to about **75m** from the mine boundary or from disused or waterlogged working'.
- Outlines of all old workings in the same seam or in any other seam within 60m are shown correctly on the Underground plan, Manager's plan, Overman's plan and Water danger plan.

Working in the proximity of bodies of water on surface or underground and unconsolidated surface deposits.

- **Warning Line** – When the working has approached **within 120m** from a water body/ unconsolidated deposits, plan shall be marked with **green verged yellow** line as warning line.
- **Statutory Restriction line** - When the working has approached **within 60m** from a water body/ unconsolidated deposits, plan shall be marked with **green verged green** as statutory line. Any advance beyond this line can only be made with the permission of CI.
- **Check survey** – Check survey shall be done when Working has approached **120m** from water body and shall be check by a surveyor other than the one normally making surveys at the colliery.

(Cir. Tech. 1/1976)

- **Off-set plans**have to be maintained on a scale having representative factor of 500:1 in respect of all existing working beneath surface features and within a distance of 45m thereof in case of working below railway, road etc. and within 15m thereof in case of working below river, canal or other surface reservoir.

(Cir. Tech 11/1982)

FMC Exam 2015

At what distance from the water bodies warning line and statutory restricted line shall be marked on the plan ?

a) 60m,120m
b) 120m,60m
c) 60m,60m
d) 120m,120m
e) 75m,120m

Ans:- (a)60m, 120m

66. Plans and sections to be submitted after abandonment, closure or discontinuance.-(1) Where anymine or seam or section thereof is abandoned or the working thereof has been discontinuedover a period exceeding 60 days, the person who was the owner of the mine at the time ofabandonment or discontinuance shall, **within 30 days after the abandonment or within 90 days after the discontinuance** of the workings, as the case may be, submit to the ChiefInspector two true copies of the up-to-date plan and section of the workings of the mine orseam or section maintained under clauses (a),(b)(c), (e) and (g) of sub-regulation (1) of regulation 65,

Provided that if a change of ownership occurs after the abandonment or discontinuance andbefore the expiry of the 30 days or the 90 days aforesaid, as the case may be, such plans andsections shall be submitted forthwith.

68. List of plans, sections and instruments and their storage.– (1) All plans and sections, and tracings or copies thereof, kept at the mine shall be serially numbered

(3) Every field book and other notes used in the preparation of plans and sections required under these regulations shall be duly indexed and kept in the office at the mine.

(4) A list of all plans and sections maintained under these regulations, or any orders made thereunder, and tracings or copies thereof; of all survey instruments with their respective type, specifications and identification numbers; and of all field books and other notes, shall be kept in a bound-paged book kept for the purpose, and updated whenever necessary. Every entry in the book maintained shall be signed and dated by the surveyor, and countersigned and dated by the manager.

To cut down procedural delay in processing and recording the Abandon Mine Plan, it is advised that AMP be submitted to RI.
(Cir. Legis. 1/1987)

70. Plans to be checked on change of ownership or on reopening, etc.– (1) When there is a change in ownership of a mine, or where a mine or part thereof is reopened, or where in any mine or part thereof it is intended to start any extraction or reduction of pillars, the owner, agent and manager shall ensure that the plans and sections of the mine or part are accurate

MULTIPLE CHOICE QUESTIONS

Plans & Sections

1. Mine plan shall be updated at every ________
   a) 4 months
   b) 5 months
   c) 3 months
   d) 6 months
2. All mine plans are now required to be maintained having representative factor ______.
   a) 1200:1
   b) 1000:1
   c) 2000:1
   d) b or c
3. What is the limit of plotting error in case of plan having scale 1:2000?
   a) 50 cm
   b) 25 cm
   c) 5 cm
   d) 10 cm
4. What is the limit of plotting error in case of plan having scale 1:1000?
   a) 50 cm
   b) 25 cm
   c) 5 cm
   d) 10 cm
5. What is the limit of plotting error in case of plan having scale 1:200?
   a) 50 cm
   b) 25 cm
   c) 5 cm
   d) 10 cm
6. Which of the following features shall be shown in surface plan?
   a) Bore hole
   b) Shaft
   c) River
   d) All
7. Joint survey plan shows the working within__________ of the common boundary.
   a) 60 m
   b) 75 m
   c) 120 m

d) 30 m

8. It is one of the statutory duty of surveyor to record full facts when the working of mine approaches to about__________ from the mine boundary.
   a) 60 m
   b) 75 m
   c) 120 m
   d) 30 m

9. Warning line shall be marked in the plan when mine working has approached __________ from unconsolidated body.
   a) 120 m
   b) 60 m
   c) 75 m
   d) 30 m

10. When the working has approached within 120 m from a water body ,then plan shall be marked with________ as a warning line.
   a) Green verged yellow
   b) Green verged green
   c) Blue
   d) Red

11. Plan shall be marked with statutory restriction line when working has approached________ from water body.
   a) 120 m
   b) 60 m
   c) 75 m
   d) 30 m

12. When the working has approached within 60m from a water body ,plan shall be marked with______________ as statutory restriction line.
   a) Green verged yellow
   b) Green verged green
   c) Blue
   d) Red

13. Any advance beyond statutory restriction line can be made only with the permission of______________.
   a) RI
   b) CI
   c) RI or CI
   d) RI & CI

14. Check survey shall be done when working approaches __________from water body.
   a) 120 m

   b) 60 m
   c) 75 m
   d) 30 m

15. Offset plan shall be maintained on a scale having representative factor of ___
   a) 500:1
   b) 1000:1
   c) 1200:1
   d) 5000:1

16. Mine plan has to be checked when there is
   a) Change in the ownership of mine
   b) After inundation
   c) Before monsoon
   d) When manager of mine is changed

17. When a mine has been abandoned, then the owner of mine shall submit up to date plan of working to CI within __________ of abandonment.
   a) 30 days
   b) 60 days
   c) 90 days
   d) 45 days

18. In case of a mine which has been abandoned, who shall submit the up to date plan of working to CI within 30 days after the abandonment?
   a) New owner
   b) Manager
   c) Agent
   d) owner of mine at the time of abandonment

19. In case of settled boundary owner, agent or manager shall inform the adjacent mine's owner,agent or manager with which boundary is settled when the working extend to within ______ of the settled boundary.
   a) 60 m
   b) 75 m
   c) 90 m
   d) 120 m

20. Underground plan shall show spot levels
   a) At working face
   b) At goad
   c) Along haulage roadway
   d) Travelling roadway

Answers

1.c 2.d 3.a 4.b 5.c 6.d 7.a 8.b 9.a 10.a 11.b 12.b 13.b
14.a 15.a 16.a 16.a 17.a 18.d 19.a 20.c

Means of Access and Egress

71. Outlets from a mine –(1)Except for the duration of shaft sinking or the drivage of other means of access and egress from the mine together with the necessary development work.No person shall be employed to work belowground, unless the working is provided withat least two shafts, inclines or other outlets to the surface –

(a) with which every seam or section of the time being at work has a communication so as toafford separate means of ingress and egress to the persons employed therein;

(b) which do not have their surface openings in the same building; and

(c) which are under the sole control of the manager :

Provided that the Chief Inspector may, permit the employment belowground even where the two shafts, inclines or outlets are not under the control of the same manager.

(2)The Chief Inspector may, by an order in writing and subject to such conditions as he may specify therein, permit the employment belowground of restricted number of persons even in a case where places in the working of the mine do not contain two means of egress from each working place.

(2)Suitable arrangements shall be made for persons to descend and ascend by each of suchshafts, inclines or outlets; and

(a) where the shaft is more than 30 m in depth, arrangements shall be made for persons to descend and ascend by mechanical means.

(b)where the incline is more than one kilometer in length (one way) or the travel by persons is arduous, a suitable man-riding system approved in writing by the Chief Inspector shall be provided for persons to access and egress from the workings of the mine.

(b) where in any shaft, ladders are used asa means of ingress or egress that should

(ii) be securely fixed in the shaft at an inclination of not more than **80 degrees** from thehorizontal;

(iii) project at least one metre above the mouth of the shaft,

(3) Distance between such shafts shall **not be less than 13.5 m from one anotherat** any point, and each shall be connected with the other by means of a **walkable passage, not less than 1.8 m high 1.5 m wide.**

(5) The foregoing provisions of this regulation with respect to shafts, inclines and outlets shallnot apply to-

(b) any working for the purpose of making a connection between two or more shafts, inclines or outlets; and

(c) any working for the sole purpose of searching for or proving minerals;

Provided that nothing in this sub-regulation shall be deemed to authorise the driving of roadways for the development of a seam before a second outlet has been made in accordance with the said provisions.

72. Working shafts – All entrances to the mine shaft shall be adequately illuminated throughout working hours

(2) Every shaft in the course of being sank shall be provided with a permanent lining of metal,concrete or masonry, which shall at **no time be more than 6m from the bottom of the shaft:**

Provided that where iron or steel rings with a substantial lagging are used below thepermanent lagging and are kept close to the bottom of the shaft, this distance may beincreased to **not more than 20 m.**

75. Periodic examination of shaft, incline and other outlets – (1) Every shaft, incline and other outlets shall be examined, once **at least in every seven days**, by anoverman or other competent person.

MULTIPLE CHOICE QUESTIONS

Means of Access & Egress

1. If ladder is used for ingress or egress of persons in a shaft, then inclination of that ladder shall not be more than__________- from the horizontal.
   a) 45^0
   b) 80^0
   c) 60^0
   d) 30^0
2. Distance between two shafts shall not be less than______________.
   a) 10.5 m
   b) 13 m
   c) 13.5 m
   d) 15 m
3. Dimension of walkable path between two shafts shall be ______.
   a) 1.8 m x 1.2 m
   b) 1.8 m x 0.75m
   c) 1.8 m x 1.5 m
   d) 1.2 m x 0.75 m
4. Every shaft shall be examined once in every __________.
   a) 14 days
   b) 30 days
   c) 15 days
   d) 7 days
5. Provision of having two shafts for working belowground may be exempted in following case:
   a) When working is made in thin seam
   b) When manpower is not more than 50
   c) When working is carried out manually
   d) When shaft is being sunk.

Answers

1.b 2.c 3.c 4.d 5.d

Winding in shafts

76. Appointment of winding engineman.- (1) No person shall be appointed as a windingengineman unless he holdsEngine Driver's Certificate.

Provided that this sub-regulation shall not apply to the **driver of an electrical** winding engine upto thirty horsepower or a steam or **compressed** air winding engine which has cylinders not exceeding **eighteen centimeters in diameter** and which is not used for raising or lowering of persons.

(3) No person, other than a winding enginemanshall operate any winding engine:

Provided that in an emergency any other competent person **may be permitted** to operate the winding engine.

(4) The name of the winding engineman on duty, together with the **period of his shift** shall be posted in the winding engine room:

Provided that where the Regional Inspector is **of the opinion that the duties of** any winding engineman are unduly arduous, he **may by an order in writing require** the period of his shift to be reduced to such period, **not less than five hours,** as he may specify

77. New winding installations – (1) When it is intended to bring into use any new windinginstallation for lowering and raising persons, the owner, agent or manager shall, **not less than 60 days** before such use, give notice of such intention to the Regional Inspector.

(2)A winding engine which is shifted from one site to the other within the same mine or from one mine toother, shall be considered as a new installation for the purpose of this regulation.

78. Construction and installation of winding equipment –(3) Unless otherwise permitted in writing by the Chief Inspector and subject to such conditions as he may specify therein, every engine for winding shall be so situated in relation to the headgear that the winding rope shall not, in the extreme position, subtend in either direction an angle more than one and a half degrees with the plane of the sheave or pulley used in connection with the rope.

(4)(a) The diameter of the drums or sheaves of the winding engine, and of the pulleys and sheaves used in connection with the winding shall, unless otherwise permitted in writing by the Chief Inspector, be **not less than 100 times the diameter of the rope.**

Structural safety audit of headgears used in mines

Ultrasound pulse velocity test should be done to assess cracks or defects in **headgear concrete.** Concrete core may also be taken to assess the compressive strength of concrete by NDT. Cover meter test or hammer test may be carried out to assess the damage. (Cir. Tech 2/2009)

79. Fittings of winding engines – At every shaft, including a shaft in the course of being sunk,where winding is affected by means of an engine, the following provisions regarding windingengines shall have effect, namely:

(1) There shall be on the drum such flanges to prevent the rope from slipping or coiling unevenly.Except in the 'friction winding' of winding, the end of the rope shall be securely fixed and there shall be at least two turns of the rope onthe drum when the cage or other means of conveyance is at its lowest working point in theshaft.

80. Shaft fittings –(2)(a) The shaft shall be provided with sufficient number of guides **to ensure smooth and safe travel of the cage** or other means of conveyance.

(3) Above the topmost landing, **'dogs'** or other **devices for holding the cage** or other means ofconveyance in the event of an **overwinding.**

(4)(a) Exception in the 'friction winding' of winding, at the top of every shaft where cages areused, suitable keps shall be provided and so arranged as to fall into the 'on' position when theoperating lever is released.

(b) At every inset where keps or folding platforms are provided, arrangements shall be madeto lock the keps or platforms securely in the 'off' position; and when in the 'off' position suchkeps or platforms shall leave the shaft clear for the passage of the cage.

(11) Protective roofing, sufficient to prevent danger from anything falling in the shaft, shall beprovided and maintained at the bottom of the shaft. The gap, both vertical and horizontal,between the protective roofing and the top of cage, when the cage is at the bottom of theshaft, shall not exceed 15 cm.

Safe gaps between cage and landing levels in winding shaft

An accident occurred in one of the coal mines when a work person was entering in to a cage at inset landing, he fell down in the shaft. The investigation revealed that the gap between the cage and the collar of the shaft at the inset landing was abnormally large which resulted in the accident. Gap between the cage and the landing level is governed by :

(a) Type of guide

(b) Gap between the guide and convincible shoe/roller.

(c) Place of landing such as at pit top, pit bottom or inter level insets.

(d) Velocity/speed of the cage.

It is recommended that in case of a shaft equipped with -

(A) Rail/ Rigid guides

(i) Rail guides with shoes as connivance in cage the gap between the cage at all landing levels shall be as close as possible and not more than 50 mm.

(ii) Rail guide with roller as connivance in cage/skip the gap between the cage at all landing levels shall be as close as possible and not more than 65 mm.

(B) Rope Guide

The gap between cage and both landing (top and bottom) shall not be more than 65mm. At inter level inset for shaft less than 100 meters in depth the gap shall be not more than 75 mm and in the shaft more than 100 meters in depth the gap shall not more than 90 mm. Further a locking device between the cage and levels gate shall also be provided for safe movement of persons. Further it is essential that swing/flap decking devices may be provided where larger gaps are warranted and it shall overlap into the cage by at least 75mm.

(Cir. Tech 7/2009)

Shaft signalling

Signals may be transmitted either by mechanical or electrical means. However ,in cases where winding depth is more than 150m, it is desirable to provide two independent means of transmitting signals between top of the shaft and the landing in the shaft. One of the signalling arrangements must be by electrical means.

(Cir. 35/1966)

Skip winding equipment in Inclined shaft/winze

In skip winding installation in an inclined shaft/winze, the following guidelines should be adopted with immediate effect:

a) The life of drawbars and hangers of the skip/conveyance shall not be more than three years if they are made of mild steel as per I.S. 226.

b) No winding rope shall be used or continued to in use if the static factor of safety is less than ten times the maximum static load.

(Cir. Tech . 14/1982)

81. Manwinding – At every shaft, other than a shaft in the course of being sunk, where awinding engine is used for the purpose of lowering or raising persons.

(2) In respect of every part of the winding installation, including pulleys or sheaves, cages, chains,distribution plates and detaching hooks, the following particulars shall be recorded in a bound paged book kept for the purpose, namely: -

(a) name of the manufacturer and the year of manufacture;

(b) specifications and dimensions;

(c) reference to every certificate supplied with the part;

(d) date of installation of each part; and

(e) any other detail that may be necessary or required by the Regional Inspector.

(6) (a) A single linked chain shall not be used, except for the short coupling chain attached toa cage or other means of conveyance.

(c) Where safety-chains are used, their length shall be such that if the king-bolt breaks, theshock to the cage or other means of conveyance is as slight as possible.

(7) Except in the 'friction winding' of winding, there shall be provided between the rope and thecage or other means of conveyance a detaching hook. The space between such detaching hook, measured from the centre of the hole for attaching it to the rope shackle, and thedetaching-bell or plate when the cage or other means of conveyance is at its normal positionat the top of the shaft, shall be **not less than 1.8** **where a geared engine is used, and not less than 3.6 m where a direct acting engine** **used.**

(9) In every shaft, the engine shall be fitted with an automatically recording speed indicator.

(10) (a) In every shaft, there shall be provided an effective automatic contrivance to prevent overspeeding and overwinding, hereinafter called the 'Automatic Contrivance", which shall prevent the descending cage from being landedat the pit bottom or other permanent landing at a speed exceeding 1.5 meters per second and also control the movement of the ascending cage in such a manner as to prevent danger to persons riding therein.

(b)The Chief Inspector may, by an order inwriting, specify the maximum speed of winding in any shaft.

Since there were instances of overwinding even in shafts having depth less than 100m, automatic contrivance should also be provided in manriding shafts having depth between 75m and 100m in a phased manner.

(Cir. Tech 1/1993)

(b) Tests of every Automatic Contrivance and every brake shall be made by the engineer orother competent persons appointed for the purpose, in the following manner -

(i) **once at least in every seven days**, by raising each cage or other means of conveyance, in turn, to pass the last control point above the topmost landing; and

(ii) **once at least in every three months**, by attempting to land the descending cage atexcessive speed. For the purpose of this test, the setting of the Automatic Contrivance may be altered so that pre-determined point in the shaft is regarded asthe landing.

(11) In addition to the Automatic Contrivance provided to prevent overwinding, a point shall be fixed and marked on the indicator of the engine in such a way as to show when the cage or other means of conveyance is at a distance of not less than twice the circumference of the drum from the completion of the wind; and if such cage or other means of conveyance contains persons, the winding engineman shall not, as soon as it has reached the point aforesaid, raise it for the remaining distance at a speed exceeding 1.2 meters per second.

(15) Not more than such number of persons as may be authorised by the manager shall beallowed to ride in the same cage or same deck of a cage or other means of conveyance atone time; and a notice specifying the number shall be posted at the top and bottom of everyshaft and at every inset. The number of persons fixed as aforesaid shall be such as to allowapproximately 0.20 square metre of floor area per person.

Maximum man-winding speeds.

As a general practice, the following speeds should be taken as maximum speeds of winding for man-winding purposes.

Depth of shaft (m)	Maximum rope speed during man-winding (m/s)
Upto 100m (such shaft are not required to be fitted with an automatic contrivance)	2
101-300	4
301-500	5.5
501-700	7
701-1000	8
1001-1500	10
Above 1500	12

Though the regulations doesnot apply to sinking shafts, the maximum man-winding rope speed in such cases may be fixed at 1.5m/s for depths upto 150 m(when no guides are provided), 2.5m/s for depths of 151-500 m and 3m/s for depths exceeding 500m.

(DGMS instruction 10-9-59)

84. Winding in sinking shafts – At every shaft in the course of being sunk, where a windingengine is use the following provisions shall have effect, namely :

(1) If the shaft exceeds 45 m in depth, there shall be provided for each bucket or othermeans of conveyance a detaching-hook between the centre of the hole for attaching thedetaching-hook to the rope shackle and the detaching bell or plate, when the bucket or othermeans of conveyance is at the top landing, there shall be a clear over-run space of not lessthan 3.6 m.

(2) Where the shaft exceeds 150 m in depth –

(a) the bucket or other means of conveyance, when used for lowering or raising persons,shall be provided with sufficient cover overhead for protection from things falling down theshaft; and

(b) there shall be provided for each bucket or other means of conveyance a sufficientnumber of guides which shall be kept extended to within 22.5 m of the shaft bottomat all times when sinking is in progress:

Provided that the Regional Inspector may, by an order in writing, require the provision ofguides in a shaft less than 150 m in depth.

3(a) Efficient means shall also beprovided and maintained for transmitting such signals from the top of the shaft to the windingengineman. The signalling appliances shall be examined by a competent person once at leastin every 24 hours.

5 (b) Where the shaft exceeds 45 m in depth, the persons working at the bottom of theshaft shall also be protected by an adequate protective covering which shall be kept loweredto within 22.5 m of the bottom of the shaft at all times when sinking is in progress.

85. Winding ropes, etc. – At every shaft where a rope is used for winding purposes, thefollowing provisions shall have effect, namely :

(2)(a) Except, in a sinking shaft less than 30 m in depth, every winding rope shall be made of cold drawn steel wire.

(b) In any shaft, including a shaft in course of being sunk, where persons are lowered orraised and where guides are not provided, no rope other than a rope of non-spinning typeshall be used.

(c) No rope which has been spliced shall be used for winding purposes.

(d) Unless exemption in writing has been granted by the Chief Inspector and subject to suchconditions as he may specify therein, no rope the braking load of which at any one pointtherein is less than 10 times the maximum static load on it when the cage or other means ofconveyance attached to the end of the rope is at the lowest working point, shall be used orcontinued in use.

(e) At every mine where a shaft is used for lowering or raising persons, at least one sparewinding rope suitable for use in such shaft, shall be kept in store.

(3)(a) For every rope in use or intended for use, a certificate showing its breaking load,quality, construction and diameter (obtained from the manufacturer or supplier).

(b) If in the case of a rope a test certificate as to the amount of its breaking load is notavailable, it shall not be used unless a portion thereof, not less than three m in length,has been cut off from the end of the rope attached to the cappel and tested in a laboratory,institution or test house approved by the Central Government for the purpose.

(4) No winding rope which has been in use for more than three and half year shall be used forwinding purposes :

Provided that where the Regional Inspector may allow the use of such rope for a longer/shorterperiod subject to condition.

(5)(a) No mode or type of capping shall be used, which fails to withstand a load of at least 10 times the maximum static load thereon.

(b) The cappel of a round rope shall not be attached to the rope by rivets passing through therope.

(c) No bent back wire type cappel shall be used with winding rope.

(d) Where white metal is used in the capping ofropes, the tapered portion of the socket shallnot be less than six and a half times the diameter of the rope for the size up to 26 millimeter and seven and one third times in case of ropes of diameters higher than 26 millimeter

Conical white metal rope capples for winding

It was found that adherence to the above specifications with adequate angle of taper in the basket of the capple may not provide enough clearance in the opening of detaching plate of safety hooks of smaller capacity. To obviate the problem without affecting the strength of capping, it was decided that-

1. For ropes upto 26mm dia, taper length of the basket of conical white metal type cappel shall not be less than 6.5 times the nominal dia of rope, and for rope size bigger than 26mm dia the taper length shall be generally in accordance with specifications of the aforesaid regulation.

2. Angle of taper in the basket of the socket shall not be less than 4.5 degree. NCB specification referred above specifies a taper length of about 7.3 times the diameter of the rope and angle of taper to about 4.5 degrees.

(Cir. 37/1974)

(e) If white metal is used in the capping of ropes -
(i) its melting point shall not exceed 300°C, and its temperature whenpoured into the socket shall not exceed 363°C;
(ii) the socket shall be heated to a temperature of about 100 °Cbeforethe white metal is poured into it.
(6) Except in the friction winder, **every rope shall be recappedonce at least in every six months. Before every such recapping, a length, including the capping, of at least two meter shall be cut off the rope to examine internal condition.**

SAFE USE OF GUIDE ROPES:

(1) Construction of Guide Ropes:
Guide ropes shall be *either 6 over 1 type of construction or half -locked coil* as described in BIS 3623 of 1978. No guide rope in non- conformity to the above standard shall be used in winding shaft.

(2) Selection of proper Guide Rope:
For optimum life of guide rope and safety, the following norm is recommended:

2.1 Up to 50m depth	-minimum 29 mm dia, 6 over 1 type of guide ropes.
2.2 Above 50m and up to 250 mtrs	–Minimum 32 mm dia, 6 over 1 type of guide ropes /29 mm dia,Half locked construction guide ropes.

2.3 Above 250 m and Up to to 500 mtrs - Minimum 38mm dia. 6 over 1 type of guide ropes or 32mm dia half locked construction guide ropes.
2.4 Above 500 m - Minimum 38mm of half locked coil type of guide ropes.

2.5 It may be noted that half locked coil guide rope may be preferred in any watery shafts because they have a smooth and larger wearing surface and offer a greater resistance to corrosion as it is not so easy for water to enter the interstices between the wires. In addition, half locked guide ropes are having higher breaking load compared to 6 over 1 construction guide ropes.

3.4 Guide rope Tension :

The following tension Is recommended in the guide ropes :
Up to 500 m depth = 1.25 Tonne per 100 meters.
From 501 m to 800 m dept = 6.25 Tonne + 0.75 tonne per additional 100 meters beyond 501 m
From 801 m and above = 8.5 Tonne + 0.5 tonne per additional 100 meters beyond 801 m

It may be noted that for the weight loading tensioning arrangement the tension to be given above include guide rope weight also. For illustration in a 200 m shaft the weight to be attached at the sump = 2 Tonne -Wt. of 200 mtrs,. of guide rope used . But in the case of tensioning from top, the tension to be given as per the above norm shall be in addition to the rope weight. For illustration in a 200 mtrs shaft the tension applied by adjusting the nut shall be 2 Tonne + Wt. of 200 m of guide rope used which may be read from the tension scale provided.

5.0 Storage: Guide rope shall be stored in reeled condition under covered shed for a period not more than two years. Enquiry into a premature snapping of guide rope n a deep shaft had revealed that the installation and the guide rope get corroded during storage.

6.0 Use of rubbing Ropes: Rubbing ropes are special guide ropes provided between the cages in shafts where clearances are Small. The construction of rubbing ropes are same to that of the guide ropes. Conforming to IS 3623 of 1973 but the tension given in the rubbing ropes shall be atleast 10% more than the tensions given in the guide ropes. Use of half locked Coil construction as rubbing ropes is preferred.

8.0 Discard Norm : Guide rope should be replaced :-
(a) When reduction in diameter is between 12% and 15% of the original diameter when new.
(b) 12% reduction in diameter if the rope is effected by corrosion of medium degree and extended to most of the portion in the shaft.
(c) Corrosion of heavy degree.
(d) 15% reduction in diameter of the rope any where along the length.
(e) When the outer rods have lost more than one third (35%) of their depth by wear or corrosion or both or the rope no longer appears safe for use due to any defect such as broken wires etc.

This circular shall apply to rubbing ropes also.

(Cir. Tech 5/2001)

Use of galvanised winding ropes in wet situations
Ropes are adversely affected in wet shafts, particularly upcast shafts. Moisture affects wires, core and the lubrication considerably and ropes have to be discarded prematurely due to corrosion and pitting. It is recommended that as far as possible,suitable galvanised winding ropes should be used in wet shafts, particularly the upcast shaft.

(Cir. 23/1972)

86. Suspension gear – (1) All parts of suspension gear in regular use shall be renewed after a period of service of not more than six years.
(2)(a) All cage chains in general use and all other parts of suspension gear between the ropeand the cage or other means of conveyance, including the detaching-hook, shall be takenapart to examine once at least in every six months.
(b) Every detaching bell or plate used in connection a safety-hook shall be examined, and theopening therein checked by calipers or gauges, once at least in every 30 days.
(3)The factor of safety shall not be less than ten for components of suspension gears and threaded jointsshall be avoided:

Provided that wherever it is not practicable to avoid a threaded joint, a factor of safety not less thanfifteen shall be ensured.

Examination of safety hooks of sinking shafts
Every detaching hook in use in sinking shaft should be taken apart, cleaned and carefully examined as to wear and deformation etc. once at least in every 7 days.

(Cir. 44/1960)

Magnetic and ultrasonic tests or any other non-destructive test , shall be done **every six months**, to detect any crack or flaw in the **suspension gear or its components** which are in regular service.
Non destructive methods may also be adopted for testing of vital components of machinery, such as drum shafts, brake, the rods, fan blades etc.
Magnetic defectograph may be used for **testing of winding ropes** at an interval **not exceeding six months.**

(Cir. Tech 10/1982)

Non-destructive test method for testing the vital components of winding engine and other equipment shall be done. Frequency of such testing is given below:

Component	Heavy duty	Medium duty	Light duty
Drum shaft electric winder	Once in a year	Once in two year	Once in four years
Drum shaft steam/compressed air operated winder	Once in a year	Once in two year	Once in two years

The duty is based on number of hours the winding engine in working per shift which is given below:

Heavy duty	Winding engine working more than 3.5 hrs/shift
Medium duty	Winding engine working between 1.5-3.5 hrs/shift
Light duty	Winding engine working less than 1.5 hrs/shift

Ultra sonic flaw detection test shall be done in case of winder drum shafts.
(Cir. Tech 4/1997)

NORMS OF DISCARD OF CAGE SUSPENSION GEAR COMPONENTS

Rope Cappels (Wedge Cappels)
1. Tightening bands being damaged, becoming out of shape due to mishandling or any other reason.
2. Marked pitting/corrosion appearing on the bands and the body.
3. Deformation in the body or excessive were on the outer or inner surface.
4. Whether the last tightening band could be tightened up to 6mm or less measured from the bottom of the tapered wedge.
5. Wear to an extent of 5% to 6% or more on the eye portion of the cappel.

Safety Hook
1. Wear on the centre pin exceeding 10% in top and bottom shackles and pins.
2. Wear exceeding 1% in top and bottom shackles and pins.
3. In the top portion of the safety hook if slackness in the pin in more than 1.6mm.
4.(a) Wear on the outer plate shall to be not more than 0.3 mm.
(b) Pitting/corrosion on the inner/working plates.
5.(a) Obliquity in the hole for the copper pin.
(b) Obliquity of holes in the top and bottom shackles (outer) limited to 10%
6. Where the shackle eye has rubbed on the plates and the wear due to such rubbing exceeds 1.6mm.
7. Any deformation, pitting/corrosion or any other defect on the projected fins of the working plates as well as the protion which rests on the catch plate.

Note : The detaching plate or safety hook is considered as a part of the hook. In case of any notch/groove due to rubbing of rope or otherwise on the circumference of the plate hole, the plate should be rejected. If there is no defect like corrosion, groove in the hole of the plate and obliquity in the holes of the tightening bolts, the plate can be allowed further use after proper heat treatment and tests for cracks etc.

Distribution Plates :
1. Marked pitting and corrosion.
2. Obliquity in the holes exceeding 10% of the original dia.
3. Where the shackle eye has rubbed on the distribution plate and wear due to rubbing exceeds 1.6mm.

Shackles and Pins :
1. Wear on shackle eye sides exceeds 1.6mm.
2. Wear on the shackle eye hole exceeds 10% of the original diameter.
3. Obliquity in the hole exceeds 10% of the original diameter.
4. Wear on pin exceeds 10% of the original diameter. Suspension Chain

Suspension chain slings :
1. Marked pitting and corrosion.
2. The wear on the contact surface of the links exceeds 10% to 12% of the nominal diameter of the link
(Cir Tech. 8/1980)

(5)Non-destructive testing shall also be adopted for testing of vital components of machinery, such as drum shafts, brake tie rods and suspension gears at regular intervals and any harmful crack or flaw detectedas a result of such tests shall be immediately reported to the Regional Inspector and use of such machineryor its components shall be discontinued forthwith.

87. Precautions after recapping, etc - **After every installation or recapping of a rope and afterevery renewal or refitting of any suspension gear, the engineer or other competent personshall, after the cages or other means of conveyance fully loaded with materials have madefive trips up and down to see that they are in proper working order.**

88. Examination of winding equipment – (1) It shall be the duty of the engineer or othercompetent person to examine –
(a) Once at least in every 24 hours –
(i) the attachment of the winding rope to the drum, the depth indicator, every part of thesuspension gear in the shaft, including cages or other means of conveyance and theirgates, and every external part of the winding apparatus, upon the proper working ofwhich the safety of persons depends; and
(ii) the brakes of the winding engines;
(b) Once at least in every seven days –
(i) each winding rope, by passing the rope at a speed not exceeding one meter persecond; and
(ii) the external parts of the winding engine, the guides and the signalling arrangementsfitted in a shaft;
(c) Once at least in every 30 days, every winding rope, by passing the rope at a speed notexceeding 0.5 metre per second. For the purpose of this examination, the

rope shall becleaned of any entrusted dirt and grease at all places particularly liable to deterioration and atother places, not more than 30 m apart throughout the length, and any reduction in thecircumference of the rope and the superficial condition of the wires as to wear, corrosion,brittleness and fracture at every such place shall be noted.

(d) Once at least in every 12 months, the winding engine as to the condition of its internalparts.

Examination of cage shall be done once at least in every six months.
(Cir. 34/1962)

89. Gates and fences –(2)(a) At every landing where it is necessary for persons to pass from one side of the shaft tothe other, pass by provided shall be not less than 1.8 m high and 1.2m wide, and shall be kept clear of all obstructions.

MULTIPLE CHOICE QUESTIONS

Winding In Shaft

1. Brakes of winding engine shall be examined once at least in every_______
   a) 24 hours
   b) 30 days
   c) 7 days
   d) 6 months
2. Period of work of winding engineman may be reduced to not less than _______ by Regional Inspector.
   a) 5 hours
   b) 6 hours
   c) 4 hours
   d) 8 hours
3. Owner , agent or manager before using new winding installation meant for lowering & raising of person, shall give not less than _________ prior notice.
   a) 75 days
   b) 30days
   c) 7days
   d) 60days
4. Fleet angle is the angle between ?
   a) Winding rope & vertical plane of pulley
   b) Winding rope & horizontal plane of pulley
   c) Winding rope & vertical plane of headgear
   d) Winding rope & horizontal plane of headgear
5. Fleet angle shall not be more than_______
   a) 1^0
   b) 1.5^0
   c) 2^0
   d) 3^0
6. Purpose of guide rope in winding shaft is _______
   a) To prevent overspeeding
   b) To prevent overwinding
   c) To ensure smooth & safe travel of cage
   d) For lowering & raising of cage
7. Purpose of 'dogs' at the topmost landing of shaft fitting is
   a) To prevent over speeding
   b) To prevent over winding
   c) To ensure smooth & safe travel of cage

d) For holding the cage in case of over winding

8. There should be provided two independent means of transmitting signals between top of the shaft & the landing in the shaft when depth of shaft is more than______
   a) 100 m
   b) 150 m
   c) 600 m
   d) 30 m

9. What will be the gap between cage & lading levels when rail/rigid guide with shoes is used as connivance in cage ?
   a) 65 mm
   b) 50 mm
   c) 75 mm
   d) 90 mm

10. In case of a shaft , gap between cage & both landing (top & bottom) shall not be more than______
   a) 65 mm
   b) 50 mm
   c) 75 mm
   d) 90 mm

11. Which of the following safety feature in winding shaft prevent overspeeding & overwinding of cage ?
   a) Guide rope
   b) Dogs
   c) Detaching hook
   d) Automatic contrivance

12. Whose duty is to examine the winding equipments?
   a) Manager
   b) Safety officer
   c) Manufacturer
   d) Engineer

13. Automatic contrivance prevents the descending cage from being landing at the pit bottom at a speed exceeding______.
   a) 1.2 m/s
   b) 1.5 m/s
   c) 2m/s
   d) 3m/s

14. What should be the maximum rope speed during man winding when depth of shaft is 100 m
   a) 2 m/s

   b) 4 m/s
   c) 7 m/s
   d) 8 m/s

15. In case of sinking shaft detaching hook shall be provided for bucket when depth of such shaft exceeds______
   a) 30 m
   b) 100 m
   c) 150 m
   d) 45 m

16. Winding rope which has been used for more than ______ shall not be used.
   a) 3 year
   b) 3.5 year
   c) 10 year
   d) 5 year

17. Melting point of white metal being used for capping or rope shall not exceed ______?
   a) 300^0C
   b) 363^0C
   c) 100^0C
   d) 360^0C

18. In case of drum winding rope should be recapped at least after every ______
   a) 6 months
   b) 3 months
   c) 12 months
   d) 3.5 year

19. All parts of suspension gear shall be renewed after period of service of not more than______
   a) 3.5 year
   b) 10year
   c) 6 months
   d) 6year

20. Non destructive test shall be done every ______ , to detect any crack in suspension gear.
   a) 3.5 year
   b) 10year
   c) 6 months
   d) 1year

21. Examination of cage shall be done once at least in every______
   a) 6 months
   b) 3 months

- c) 12 months
- d) 3.5 year

22. Dimension of pass bye provided for persons to pass from one side of the shaft to the other should be ________
  - a) 1.8 m x 1.2 m
  - b) 1.8 m x 1.5 m
  - c) 1.8 m x 0.75 m
  - d) 1.2 m x 0.75 m

23. Condition of internal parts of winding engine shall be examined once at least in every________
  - a) 12 months
  - b) 6 months
  - c) 3 months
  - d) 30 days
  - e)

Answers

1.a 2.a 3.d 4.a 5.b 6.c 7.d 8.b 9.b 10.a 11.d 12.d 13.b
14.a 15.d 16.b 17.a 18.a 19.b 20.c 21.a 22.a 23.a

Haulage

92. Haulage roadways – The following provisions shall have effect with respect to everylength of road or roadway in a mine where materials are transported in tubs by means ofgravity of mechanical power, namely :

(4) Where haulage is effected by one or more ropes, there shall be provided and maintained -

(a) at the top of every inclined plane, at least one **stop-block** or other effective contrivance **to arrest tubs from running or moving out of control;**

(b) at least **one run way switch** or other effective contrivance below the first stop-block orother effective contrivance at a distance greater than the length of a set or train of tubs:

Provided that such distance shall **not exceed** the length of **a set or train of tubs by more than 10 m.**

(c) an attachment, behind an ascending tub or set or train of tubs, of a **back-stay,** drag orother suitable contrivance for preventing the tub, set or train of tubs running back.

(d) safety hooks, jazz-rails or other suitable contrivances to prevent runaway in the forwarddirection;

(e) **tub re-railers at intervals of not more than 250 m.** Where a tubs is re-railed manually,it shall either be detached from the rope or ropes or the haulage engine which works the ropeshall be stopped; and

(f) on every haulage roadway **exceeding 30 m** in length, effective means of **transmitting signal** from every stopping place on the roadway to the place at which the machinery workingthe rope is operated.

8.Where in any mine belowground, a system of haulage roadway (and conveyors, if any)extent to distance of **more than 300 m** from the shaft or the entrance to the mine,efficient **telephonic communication** shall be provided and maintained between the end ofevery such system and the bottom and top of the shaft or the entrance to the mine as thecase may be .

(c) Where telephones or electrical signals are provided –

(ii) signal wires shall be supported on insulators, and shall not be energised at **more than 30 volts;**

(iv) in every gassy seam of the second or third degree, all signalling or telephonic communication circuit shall be constructed, installed, protected, operated and maintained in such a manner as be intrinsically safe.

(6)(a) Where any person is allotted to work or pass while the haulage is in motion, **manholes**for refuge shall be provided at intervals of **not more than 10 m:**

Provided that where the gradient is **less than 1 in 6** such manholes may be provided atintervals of **not more than 20 m.**

(b) Manholes shall be not less than **1.8 m in height and 1.2 m in depth, and not less than 0.75 m but not more than one metre in width.**

Provided that where the roadway is less than 1.8 m in height, the manholes may bemade to the full height of the roadway.

(c) Every manhole shall be kept clean and clear of obstruction, and white washed both insideand for a distance of **not less than 0.3 m** around the aperture.

(d) As far as practicable, all manholes shall be provided on one side of the haulage roadway.

(8) At all places where tubs are coupled or uncoupled, there shall be a clear space of not lessthan one metre –

(a) between, the tubs and one side of the roadway; and

(b) where there are two or more tracks also between the adjacent tracks.

93. Travelling roadways –(2) Every such travelling roadway shall –

(a) **be not less than 1.8 m** high throughout;

(b) where the inclination exceeds **30 degrees from the horizontal, be provided with suitable steps or ladders;**

(c) where inclination **exceeds 45 degrees** from the horizontal, be provided, in addition **to steps or ladders**, with **hand rails or ropes** so as to ensure safe travel; and

(d) where the inclination exceeds **60 degrees** from the horizontal, be provided, in addition tothe steps or ladders and rails or ropes, with **suitable platforms at intervals not exceeding** 10 m **measured along the slope.**

(6)In case the travelling distance from the incline or adit mouth or pit bottom **exceeds one** kilometer orthe travelling is arduous, the **owner, agent and manager** shall provide suitable man-riding arrangement **asapproved by the Chief Inspector.**

(7) No haulage shall be used for the general conveyance of persons except with thepermission in writing of the Chief Inspector.

94. Tubs and their movement – (1)On every tub there shall be provided and maintained ateach coupling end a strong buffer projecting beyond the end and so arranged that when twosuch tubs are in tandem, the gap between the innermost ends shall not be less than 20 cm.

(2) On every side-tipping tub in use, safety-catches shall beprovided to prevent accidentaltipping.

(4) The state of every buffer and drawbar of every tub in use and of every safety-catch,coupling-chain and other attachment shall be examined once at least in every 14 days, by acompetent person appointed for the purpose.

(5) Each component of coupling shall have **factor of safety of not less than seven** in relation to maximum static load which shall be ensured by **testing at an interval not exceeding three years** and record thereof shall be maintained

(7) Two tubs shall be deemed to be in close succession when the distance between them at any time in **less than 10 m.**

(9) No person while taking a tub down a gradient exceeding 1 in 20, shall go in front of thetub; and in every case where conditions are such that a person cannot control the tub frombehind, he shall not take the tub down unless sprags or other suitable contrivances are usedto control it.

(11) Every tub while standing on a track having a gradient of more than 1 in 20 shall unless heldeffectively by brakes or securely coupled to a haulage rope or locomotive, be effectivelyblocked, chained or otherwise secured.

The attachment between any two tubs in a set or train of tubs is required to be a type approved by the Chief Inspector as required under Reg. 94 of the Coal Mines Regulations, DGMS(Tech) circular 1 of 1986 recommended design of four types of tub couplin_s namely.

1) Hook coupling
2) Two shackles and pin 'R' type
3) Shackle and pin
4) 'C' type coupling. -

These four types of couplings conforming to DGMS(Tech) circular 1 of 1986 can be used in haulage system in mines and no separate DGMS approval is necessary.

(Cir. Tech 9/2004)

96. Haulage Ropes –(1) **No rope shall be used for purposes of haulage if it has any serious visible defect over any length or its factor of safety is less than eight**

(2) Every rope which is capped shall be recapped once at least in every six months.

Haulage rope should be discarded if –

i. Its factor of safety becomes less than 7.
ii. Rope diameter is reduced by 15% or more.
iii. Total number of cracked or broken wires exceeds 3 over a length of one lay of the rope or 1/10th of the total number of wires, excluding core wires over a length of 30 times the diameter of rope.

(3)No rope which has been spliced shall be used in direct haulages.

(4) For every haulage rope in use, a record of size, construction, quality, name of supplier, and dates ofinstallation and of recapping, shall be kept in a bound paged book kept for the purpose, and all entriestherein shall be made by the competent person who shall sign the same and date his signature.

97. Roadway Conveyors – (1) Every roadway conveyor shall be so installed that –

(a) between the conveyor and one side of the roadway, there is a travelling space fromobstruction **not less than 1m wide.**

(d)in case a number of belt conveyors are used in series, safety fittings such as sequential control andsequential interlock shall be provided; and

(e)it can be stopped from any place along the entire length of the conveyor by providing pull cordswitches or any other suitable system.

(3) On every length of roadway in which a conveyor is installed for transporting loads over adistance exceeding 30 m, there shall be provided and maintained effective means oftransmitting signals.

(10) Adequate arrangement shall be provided in the belt conveyor to ensure that it gets automaticallystopped,-

(a)in case of excessive friction between the belt and the drum, roller, scrapper, deflectors, guides or anyother obstruction caused either due to spillage or otherwise;

(b)in case of breakage of the belt; and

(c)in case of fire or heating in the belt conveyor or in the vicinity thereof.

98. Examination of haulage engines – (1) It shall be the duty of a competent person toexamine carefully -

(a) once at least in every 24 hours, every haulage engine, brake-wheel, rope and otherappliance in use; and

(b) once at least in every seven days, every track where the haulage is effected by means ofmechanical power of gravity, and every safety contrivance fitted thereon.

99. Examination of haulage and travelling roadways – It shall be the duty of the overman orother competent person to examine carefully, once at least in every seven days, the state ofall haulage and travelling roads and roadways, including roadways leading to all the outlets ofthe mine which are in use.

100. Locomotives – (2) No locomotive shall be used where the gradient of the trac exceeds 1 in 15.

101. Roads for trucks and dumpers. – The design, construction, dimensions and layout of haul roads (including ramps) and of parapet walls or embankments or berms, to be provided along the edge of any road that exists above the level of surrounding area or of any spoil or coal dumpshall be as per the following :

Conditions for Haul Roads

(1)No vehicle other than HEMM shall be used on haul roads except between designated points and when permitted in writing by the manager.

(2) All haul roads in opencast workings shall be arranged to provide one way traffic having width of the largest vehicle plying on that road plus 5m. Where this is not practicable, no road shall be of a width less than three times width of the largest vehicle plying on that road plus 5m.

(4) All corners and bends on roads shall be made in such a way that the operators of vehicles have a clear view of distance of not less than 3 times the breaking distance as specified by the manufacturer in respect of the HEMM speeding at 40 Km/hour. Where it is not possible to ensure a visibility for a distance as mentioned above, there shall be provided with two separate roads of width not less than 2 times plus 3m of largest vehicle plying on the road with a strong road divider at centre with adequate lighting and reflector along the divider.

(5) No road shall have a gradient steeper than 1 in 16.Ramps shall be used for crawler mounted machines only and not for tyre mounted machines. Gradient of ramps shall not be steeper tha 1 in 10 and its length shall not be more than 50m at one stretch.

(6) Where any road existing above level of surrounding area, it shall be provided with strong parapet wall/embankment of following dimensions:

i) Width at top-not less than 1 m.

ii) Width at bottom-not less than 2.5m.

iii) The height not less that the diameter of the largest tyre of the vehicles plying on the road. Dumping of mud or overburden shall not be treated as strong parapet wall.

(7) Separate haul road shall be provided for light vehicles plying in the mine premises. Where it is not practicable, definite turnouts, crossing points and waiting points shall be designated for use of vehicles.

(8) At every curve, parapet walls or vertical posts with 'Zebra' line shall be provided to help the drivers to keep the transport vehicle on the track especially at night times.

"haul road" means any passage or road, which is maintained and used in connection with the working of opencast mines for plying of machinery within the precincts of a mine.

DUMPER: The maximum speed of vehicle shall be restricted to 30Km/hours by blocking higher gear or any other automatic means.

GENERAL

1) The stability test of HEMM shall be carried out **at least once in yearand** after every major over haul by an independent agency.

2) The crane and overhead crane shall be subject to proof load test and non-destructive test once in a year from a competent authority.

3) The pressure vessel receiver are subjected to hydraulic and non-destructive test and shall be carried out by a competent authority.

(Cir. Tech 9/2008)

Road of LMVs shall not cross the haul road of dumpers anywhere in the mine but where such crossing of roadway cannot be avoided for reasons, which are to be vetted by the Internal Safety Organization (ISO) of the mining company and approved by the Regional Inspector in writing, the following safety measures shall be strictly ensured-

I. All such crossings shall be planned in close consultation with the ISO of the company.
II. All such crossings shall be clearly visible to operate of both LMVs and dumpers for a distance of atleast 3 times the braking distance of the largest dumper plying.
III. The approach to such crossings shall be provided with suitable speed barriers, as approved/vetted by the ISO of the mining company, in the carriageway for LMVs at a distance of not more than 30m from the crossing.

(Cir. Tech 6/2010)

Where heavy machineries are deployed, at least once in two weeks the brakes of the truck, dumper or any such vehicle should be tested.

Surprise inspection shall be carried out by the engineer/superior official at an interval not exceeding 15 days to ensure that examination schedule of machineries/equipment is followed.

(Cir. Tech. 3/1981)

102. Movement of wagons –(10) Wherever railway wagons are specially placed so as to afford a thoroughfare, suchthoroughfare shall be not less than five metres in width.
(11) No material shall be placed or dumped within 1.2 m from either side of a track of rails.

103. Fencings and gates –(2)Where occupied buildings are situated within 15 meters of any haulage road, tramline, rail line or haul road, a substantial fence shall be provided and maintained between such buildings and the haulage road, tramline, rail line or haul road.

MULTIPLE CHOICE QUESTIONS
Haulage

1. Which of the following safety features are there in a haulage roadway?
   a) Stopblock
   b) Runaway switch
   c) Backstay
   d) All
2. Main purpose of stopblock in haulage roadway is to –
   a) Prevent the tub from running backward
   b) Prevent the tub from running out of control
   c) Lower the speed of moving tub
   d) To prevent runaway in forward direction
3. Main purpose of backstay in haulage roadway is to –
   a) Prevent the tub from running backward
   b) Prevent the tub from running out of control
   c) Lower the speed of moving tub
   d) To prevent runaway in forward direction
4. Main purpose of safety hook/jazz rail in haulage roadway is to –
   a) Prevent the tub from running backward
   b) Prevent the tub from running out of control
   c) Lower the speed of moving tub
   d) To prevent runaway in forward direction
5. Which among the following safety equipment is used to arrest the tub running or moving out of control-
   a) Backstay
   b) Jazz rail
   c) Stopblock
   d) Runaway switch
6. Distance between runaway switch and stopblock shall not exceed the length of tub tubs by more than ________
   a) 10 m
   b) 20 m
   c) 30 m
   d) 15 m
7. Tub re-reailers shall be placed at an interval of not more than______
   a) 250 m
   b) 10 m
   c) 150 m
   d) 100 m

8. Effective means of transmitting signal shall be there, when the length of haulage roadway exceeds______.
   a) 100 m
   b) 30 m
   c) 10 m
   d) 150 m

9. Effective telecommunication should be there, when length of haulage roadway exceeds more than______
   a) 100 m
   b) 30 m
   c) 300 m
   d) 150 m

10. Signal wire shall operate at a voltage not exceeding__________
   a) 30 V
   b) 125 V
   c) 250 V
   d) 25 V

11. Dimension of manhole__________.
   a) 1.8 m x 1.5 m x 0.75 m
   b) 1.8 m x 1.5 m x 1.2 m
   c) 1.8 m x 1.2 m x 0.75 m
   d) 1.8 m x 1.2 m x 1.5 m

12. When gradient is less than 1 in 6 manhole shall be provided at an interval of not more than__________
   a) 10 m
   b) 20 m
   c) 15 m
   d) 25 m

13. When gradient is more than 1 in 6 manhole shall be provided at an interval of not more than__________
   a. 10 m
   b. 20 m
   c. 15 m
   d. 25 m

14. Every manhole shall be kept clean for a distance not less than ________around the aperture.
   a) 1.8 m
   b) 0.75 m
   c) 1 m
   d) 0.3 m

15. At a place where tubs are coupled or uncoupled there shall be a clear space of not less than ____________between the tub and one side of roadway.
   a) 1.8 m
   b) 0.75 m
   c) 1 m
   d) 0.3 m

16. Height of travelling roadway shall be__________
   a) <1.8 m
   b) ≥1.8 m
   c) 1.2 m
   d) 0.75 m

17. There is a provision to provide steps in travelling roadway, when the inclination of roadway exceeds________
   a) 45^0
   b) 30^0
   c) 60^0
   d) 20^0

18. Two tubs shall be said to be in close succession when the distance between them at any time is less than__________
   a) 10 m
   b) 20 m
   c) 15 m
   d) 5 m

19. Recapping of haulage roadway shall be done once at least in every______
   a) 3 months
   b) 6 months
   c) 12 months
   d) 30 days

20. No locomotive shall be used when the gradient of the track exceeds______
   a) 1 in 14
   b) 1 in 15
   c) 1 in 16
   d) 1 in 6

21. Haulage and travelling roadway shall be examined once at least in every_____
   a) 7 days
   b) 30 days
   c) 3 months
   d) 14 days

22. Fencing shall be provided when any occupied building falls within ______ of any haulage.

a) 10 m
b) 15 m
c) 12 m
d) 20 m

Answers

1.d 2.b 3.a 4.d 5.c 6.a 7.a 8.b 9.c 10.a 11.c 12.b 13.a
14.d 15.c 16.b 17.b 18.c 19.b 20.b 21.a 22.b

Mine Workings

104. Safety management plan.- (1) The owner, agent and manager of every mine shall-

(a)identify the hazards to health and safety of the persons employed at the mine to which theymay be exposed while at work;

(b)assess the risks to health and safety to which employees may be exposed while they are atwork;

(c)record the significant hazards identified and risks assessed;

(d)make those records available for inspection by the employees; and

(e)follow an appropriate process for identification of the hazards and assessment of risks.

(2)The owner, agent and manager of every mine, after consulting the safety committee of the mineand Internal Safety Organisation, shall determine all measures necessary to-

(a)eliminate any recorded risk;

(b)control the risk at source;

(c)minimise the risk; and

(d)in so far as the risk remains,

(i)provide for personal protective equipment; and

(ii)institute a program to monitor the risk to which employees may be exposed.

(3)Based on the identified hazards and risks, the owner, agent and manager of every mine shallprepare an auditable document called "Safety Management Plan", that forms part of the overallmanagement and includes ,organizational, structure, planning, activities, responsibilities,practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining a safety and health policy of a company.

(4)It shall be the duty of the owner, agent and manager to implement the measures determinednecessary and contained in the Safety Management Plan for achieving the objectives set out in sub-regulation (2) in the order in which the measures are listed in the said sub-regulation.

(5)The Safety Management Plan shall contain-

(a)defined mine safety and health policy of the company;

(b)a plan to implement the policy;

(c)how the mine or mines intend to develop capabilities to achieve the policy;

(d)principal hazard management plans;

(e)standard operating procedures;

(f)ways to measure, monitor and evaluate performance of the safety management planand to correct matters that do not conform with the safety management plan;

(g)a plan to regularly review and continually improve the safety management plan;

(h)a plan to review the safety management plan if significant changes occur; and
(i)details of involvement of mine workers in its development and application.

(6)The owner, agent and manager of every mine shall periodically review the hazards identified andrisks assessed, to determine whether further elimination, control and minimisation of risk is possible andconsult with the safety committee on review.

(7)The owner, agent or manager of every mine shall submit a copy of the Safety Management Plan tothe Regional Inspector who may, at any time by an order in writing, require such modifications in the plan as he may specify therein.

(8)The owner, agent and manager of every mine shall be responsible for effective implementation ofthe Safety Management Plan.

105. Manual opencast working.– In manual opencast workings, the following precautions shall be observed, namely

(1) In alluvial soil, morum gravel, clay, debris or other similar ground -

(a) (i) the sides shall be sloped at an angle of safety **not exceeding 45^{0}**from the horizontal or such other angle as the Regional Inspector may permit.

(ii) the sides shall be kept benched and the height of any bench shall **not exceed 1.5** m and the breadth thereof shall not be less than the height.

(b) where any pillar is left in situ for the purpose of measurement, its height shall not exceed 2.5 m; and where the height of such pillar exceeds 1.25 m, the base of the pillar shall not be less than 1.5 m in diameter.

(3) In coal, the sides shall either be kept sloped at an angle of safety **not exceeding45^{0}** from the horizontal, or the sides shall be kept benched and the height of any bench shall not exceeds 3 m and the breadth thereof shall not be less than the height.

(4)In an excavation in any hard and compact ground or in prospecting trenches or pits, the sides shallbe adequately benched, sloped or secured so as to prevent danger from fall of sides.

Provided that the height of the bench shall not exceed six meters.

106. Mechanised opencast working.- (2)Before starting a mechanised opencast working, the owner and agent of the mine shall ensure thatthe mine, including its method of working, ultimate pit slope, dump slope and monitoring of slope stability,has been planned, designed and worked as determined by a scientific study and a copy of the report of such study has been kept available in the office of the mine.

(4) The height of the benches in overburden consisting of alluvial soil, morum, gravel, clay, debris or other similar ground shall not exceed 3 meters and the width thereof shall not be less than three times the height of the bench.

(5)The height of benches in coal and overburden of rock formation other than that mentioned in sub-regulation (4) shall not be more than the digging height or reach of the excavation machine in use fordigging, excavation or removal, and the width thereof shall not be less than -

(a)the width of the widest machine plying on the bench plus two meters; or
(b)if dumpers ply on the bench, three times the width of the dumper; or
(c)the height of the bench,whichever is more.

107. Reclamation.- All excavations made by opencast mining shall be suitably reclaimed by back fillingor by any other means.

108. Spoil-banks and dumps.- (1) While removing overburden, the top soil shall be stacked at a separateplace, so that, the same is used to cover the reclaimed area.

(2)The slope of a spoil bank shall be determined by the natural angle of repose of the material beingdeposited but, in any case, shall not exceed 37.5 degrees from the horizontal.

(4)Any spoil bank exceeding 30 metre in height shall be benched so that no bench exceeds 30 metre inheight and the overall slope shall not exceed 1 vertical to 1.5 horizontal.

(5)The toe of a spoil-bank shall not be extended to any point within 100m of a mine opening, railwayor other public works, public road or building or other permanent structure not belonging to the owner.

(6)A suitable fence shall be erected between any railway or public works or road or building orstructure not belonging to the owner and the toe of an active spoil bank so as to prevent unauthorized persons from approaching the spoil-bank.

109. Transport rules.- (1) The manager of every mine shall frame and enforce a code of transport ruleswith due regard to the size and capacity of the transportation machinery in use and prevailing localconditions and a copy of the same shall be submitted to the Regional Inspector.

110. Codes of practice.- (1) The manager of every mine shall, before introducing any machinery or newoperation connected with his mine, frame and enforce "code of practice", not being inconsistent with theAct or these regulations, for each such machinery or operation, as the case may be.

(2)The codes of practice shall be framed with due regard to the type, size and capacity of themachinery or operation in use and prevailing local conditions and a copy of the same shall be submitted tothe Regional Inspector, who may at any time, by an order in writing, require such modifications in the codes as he may specify therein:

(3)The codes of practices, inter alia, shall provide for–

(a)safe operating procedures for the machinery or operation to which it relates to;

(b)examination and testing of the machinery before first use after erection, installation, re-installation, modification, alteration, maintenance or repair;

(c)schedule and nature of examination and testing of the machine, including its sub-assemblies,so as to ensure its safe operation;

(d)the manner in which the records of examination shall be kept.

111. Development work –

(2) no gallery in a seam or section shall exceed **3 m in height or 4.8 m in width** at any place.

(3) The pillars formed in any seam or section shall normally be rectangular in shape.

[**Extra shots**: Reason for rectangular pillar- Factor of safety of rectangular pillar is more than that of square pillar.]

(4) The distance between the centers of any two adjacent pillars left in a seam or section shall not be less than that specified in the appended table as corresponding to the depth of the seam or section from the surface at that point and the width of the galleries in the workings in question.

Depth of seam from surface	Where the width of the galleries does not exceed 3.0 m	Where the width of the galleries does not exceed 3.6 m	Where the width of the galleries does not exceed 4.2 m	Where the width of the galleries does not exceed 4.8 m
	The distance between centres of adjacent pillars shall not be less than			
	M	M	M	M
Not exceeding 60 m	12.0	15.0	18.0	19.5
Exceeding 60 but not exceeding 90 m	13.5	16.5	19.5	21.0
Exceeding 90 but not exceeding 150 m	16.5	19.5	22.5	25.5
Exceeding 150 but not exceeding 240 m	22.5	25.5	30.0	34.5
Exceeding 240 but not exceeding 360 m	28.5	34.5	39.0	45.0
Exceeding 360 m	39.0	42.0	45.0	48.0

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The distance between centres of adjacent pillars at a depth of 140m from surface where gallery width is 3 m shall not be less than ________?

a. 19.5 m
b. 42 m
c. 45 m
d. 16.5 m
e. 13.5 m

Ans: (d) 16.5 m

Guidelines for Stability of Belowground Coal Mine Workings Due to Opencast Blasting

1.0 Introduction

The safety and stability of belowground coal mine openings, coal pillars, water dams, ventilation and isolation stopping in close proximity to operating opencast mines are often endangered from blast induced vibrations. The serious concern is possible damage to above belowground structures from nearby large surface blasts. Any vibration produced rock fall or minor cracks in isolation stoppings would be recognized as an unacceptable hazard.

2.0 Damage Criteria

Peak particle velocity has so far been considered as the best criterion for evaluating blast vibrations in terms of its potential to cause damage.

[Extra Shots

Peak Particle Velocity (PPV) – The maximum speed (measured in mm/sec or in/sec) at which a particle in the ground is moving relative to its inactive state.]

3.0 Responses of roof and pillars

The roof of the belowground working vibrates with higher amplitudes of vibrations compared to pillars. The attenuation of vibration in roof is fast than that in pillars. This indicates that the pillars of below ground working experiences vibration for a longer period compared to the roof.

4.0 Measurement of blast induced vibrations

4.1 Instrumentation : The seismograph selected for monitoring blast-induced vibration shall be simple, light, compact, easily portable, battery operated, digital output, triggering by geophone etc.

Triaxial transducers for recording blast vibrations shall have a **linear frequency range from 2 Hz to 250 Hzand capable of recording particle velocity upto 250 mm/s.**

4.2 Methodology - The transducer of seismograph shall be placed in the junction of the roof. It may also be placed in the pillars at 1-2 m below the roof at a depth of 0.5-0.6 m inside the pillar. A minimum of a 20 observations corresponding to a minimum of 10 blasts shall be made for better prediction with a high index of determination.

5.0 Guidelines on experimental blasting

5.1 Factors : Major factors affecting particle velocity of ground vibration are type and amount of explosives charge used, distance from the blast site to the location of belowground workings, geological, structural and physical properties of the rock that transmits the vibration and blast geometry. Use of safe maximum explosives per delay, in-hole delays with Nonel systems, proper burden, spacing and proper stemming of holes reduces blast induced ground vibrations.

5.2 Plan : A plan showing the opencast workings above the belowground coal mine in different prominent shades shall be prepared. The plan shall incorporate all the belowground structures including isolation/ventilation stoppings, different working faces, water dams etc. Plan should also show the place of and location of vibration monitoring transducers in roof and pillars.

5.3 Study/Observations : In a particular mining area where opencast blasting is to be performed above the belowground structures, experimental blasting shall be carried out, prior to commencement of drilling and blasting operations by any research/Academic Institute for optimizing the blast design parameters to restrict the vibrations in belowground workings within safe limit. The type of instruments, the methodology and predictor norms as recommended in para 4.0 shall be followed in measurement of blast induced vibrations. Based on the study, the safe charges for the safety of belowground structures shall be determined and recommendations should be made in the report.

5.0 Recommended permissible standards of vibrations

5.1 Technical considerations - The degree of damage observed in the belowground openings is influenced by the RMR of the roof rock. Thus, the damage criterion for belowground coal mine workings is based on RMR, because it includes the parameters like layer thickness, structural features, rock weatherability, and strength of the roof rock and groundwater seepage.

5.2 **Permissible standards**- The junctions of the belowground coal mine workings are more susceptible to blast produced cracking than the galleries away from the junctions. The threshold values of vibration at the junctions in terms of peak particle velocity has been given in Table 1 for different RMR of roof rocks for the safety of belowground coal mine workings. The limiting values of vibration in the pillar are also given below in Table 2.

Table 1. Threshold values of vibration for the safety of roof in the below ground workings for different RMR

RMR of roof rock	Threshold values of vibration in peak particle velocity (mm/s)
20-30	50
30-40	50-70
40-50	70-100
50-60	100-120
60-80	120

Table 2. Threshold values of vibration for the safety of pillar in the belowground workings for different RMR

RMR of roof rock	Threshold values of vibration in peak particle velocity (mm/s)
20-30	20
30-40	20-30
40-50	30-40
50-60	40-50
60-80	50

(Cir. Tech. 6/2007)

112. Depillaring operations – (1) No extraction or reduction of pillars shall be commenced, conducted or carried out except with the permission in writing of the Regional Inspector and such application shall be accompanied by two copies of an up-to-date plan of thearea where pillars are proposed to be reduced or extracted showing the proposed extend of extraction or reduction of pillars, the manner in which such extraction or reduction is to be carried out the thickness and depth of the seam, the nature of the roof, and the rate and direction of dip.

3 (b) During the extraction of pillars, no splitting or reduction of pillars or heightening of galleriesshall be affected for a distance greater than the length of two pillars ahead of the pillar that isbeing extracted or reduced :

Extra Shots

[Reason: This is done to reduce the zone of stress concentration for ensuring stability of the workings]

Provided that where pillar extraction is about to begin in a district such splitting or reduction ofpillars or the heightening of galleries shall be restricted to a *maximum of four pillars*. Thewidth of the split-galleries shall not exceed the width prescribed for galleries under regulation99(4).

(6) Where the voids formed as a result of extraction are stowed with sand or other materials,the owner, agent or manager shall, **on or before the 10th day** of every month submit to theRegional Inspector a statement giving the quantity of coal raised and the quantity of sand orother material stowed in every district during the preceding month.

Application for depillaring should cover areas sufficiently large to last for a period of atleast 3 years. The applications should be submitted to DGMS atleast 3 months in advance of the proposed date of commencement of depillaring operations.

(Cir. 15/1960)

Minimum thickness of stoppings shall be as follows:

Gassiness of seam	**Minimum thickness of stopping in case of**		**Remarks**
	By caving method	**With stowing(of all voids and galleries upto the stopping)**	
III degree	**Two stoppings each 1m thick and 4.5 m apart, with the intervening space packed solid with incombustible material.**	**1m**	**If an area, only partly extracted and stowed is sealed off prematurely due to heating or otherwise, the stoppings shall be re-inforced as in case of extraction by caving method.**
I and II degree	**1m to be reinforced as in case of III degree, if inflammable gas behind the stopping exceeds 2%.**	**0.5m**	**In gassy seam of I degree, stopping may also be built of RCC provided the thickness is not less than 0.3m**

Minimum depth of locking of both brick and RCC stoppings into roof, floor and sides should be as follows:

	Brick in cement/lime mortar	**RCC**
In coal	**100cm**	**50cm**
In shale roof/floor	**30cm**	**30cm**
In sandstone roof/floor	**15cm**	**15cm**

Where water is likely to accumulate behind stopping, there shall be provided in the stopping 'water seal' viz. a suitable pipe or other device to drain away the water without permitting any leakage of air or gas.
Stopping should be kept properly whitewashed to enable fine cracks to be detected.

(Cir. Tech 3/1988)

	Crossing point temperature		**Moisture content**		susceptibility
A	**More than 160°C**	**P**	less than 2 percent	**X**	poorly susceptible
B	140°-160°C	**Q**	(2-5) percent	**Y**	moderately susceptible
C	(120°-140°C)	**R**	More than 5 percent	**Z**	highly susceptible.

(Cir. Tech. 3/1994)

113. Extraction of coal by method other than the Bord and Pillar system – (1) No development or extraction of coal by a system other than bord and pillar system shall be commenced, conducted or carried out except with the previous permission in writing of the Chief Inspector.
(2) An application for such permission shall be made accompanied by two copies of an upto date plan of the area where such development or extraction is proposed, showing details such as the manner and proposed extent of development or extraction.
114. Saving – Nothing in regulation 99 or regulation 100 shall prevent the driving ofany gallery through any pillar or the enlargement of any gallery beyond the limits specified byor under these regulations, where in the opinion of the manager such work is necessary forhaulage, ventilation, drainage or any other purpose necessary for the proper working of themine, if **14 days'** previous notice in writing of the intention to commence such work has beengiven to the Regional Inspector. Every such notice shall be accompanied by an offset planshowing details of the operation.

115. Roads and working places –(3) Whenever crush of pillars or any symptom of an impending collapse other than ordinarily caused by pillar extraction is detected, the manager shall inform the Regional Inspector forthwith.

116. Powers of Inspectors –If in any mine or part thereof, it appears to the Regional Inspectorthat the provisions of regulations 98,99, 100 and 102 or of any order issued under any ofthese regulations have not been complied with, he may give notice in writing to the owner,agent or manager requiring him to take such protective measures, within such time as he mayspecify in the notice. In case of non-compliance with the requirements of the notice, theRegional Inspector may, by an order in writing, prohibit the extraction of coal in the part orparts of the mine in which protective measures are required to be taken, until therequirements specified in the notice are complied with.

117. Pointing out contraventions during inspections – (1) If the Chief Inspector or anInspector, during his inspection of any mine, finds or comes to know of any contravention ofany provisions of Act or the regulations, rules, bylaws of orders made thereunder, he shallenter such contravention in register kept for the purpose at mine in **Form 6** and shall also point out such contravention to the owner, agent or manager, it present on the spot.
(2) When an entry is made in the register –
(b) a copy thereof shall be displayed **within 3 days** of the date of such entry on the noticeboard of the mine for **not less than 15 days.**
(3) The owner, agent or manager of the mine shall return one copy, within a period **not exceeding 15 days** from the date of the entry, to the Chief Inspector or the Inspector whomade the entry with remarks thereon showing the action taken to remedy the contraventionand the date on which such action was taken.
(4) The register –

(a) shall be kept available for inspection in the office of the mine for a period of **atleast 3 years** after the date of making of the last entry in it.

FMC Exam'14

In which form contravention found by inspector during inspection of mine be entered?

a. Form 1

b. Form IV

c. Form 5

d. Form 6

e. Form 3

Ans : (d) Form IV

118. Multi-section and contiguous workings –(1) No work in a higher seam or section shall bedone over an area in a lower seam or section which may collapse.
(2)(a) No workings shall be made in more than one section in any seam, nor shall workingsmade in **any two seams lying within 9m of each other**, without the prior permission inwriting of the Chief Inspector.
(b) Every such application for permission shall be accompanied by twocopies of a plan showing the proposed layout of the workings, a section of the seam orseams, the depth of the seam(s) from the surface, the rate and direction of dip, the proposeddimensions of pillars and galleries in each seam or section, and the thickness of the partingbetween the seams or sections.
(c) Where two or more such seams or sections are worked in a mine, the pillars in one seamor section shall as far as practicable, be vertically above or below the pillars in the other seamor section unless the strata are inclined at an angle of more than 30 degrees from thehorizontal.
(d) The parting left between any two such seams or section shall not be less than three m in thickness at any place .

119. Workings under railways and roads, etc. – (1) No workings shall be made and no work ofextraction or reduction of pillars shall be conducted at, or extended to, any point **within 45 m of any railway, or of any public worksor** of any public road orbuilding, or of other permanent structure not belonging to the owner of the mine,without the prior permission in writing of the Chief Inspector.
(2) Every application for permission under sub-regulation (1) shall specify the position of theworkings of the mine in relation to the railway or public road or works or building or structureconcerned, the manner in which it is proposed to carry out the intended operations, and the limits to which it is proposed to carry out the said operations; and shall be accompanied bytwo copies of a plan showing the existing and the intended mining operations in so far as theyaffect the railway or public road or works or building or structure concerned.

SMC Exam'14

No working shall be made within________ of any railway or any public works.

a. 30m

b. 45m

c. 60m

d. 15m

e. 75m

Ans : (b) 45m

121. Working near mine boundaries in belowground mines.–– (1) The owner, agent or manager of every mine shallhave fixed boundaries of the mine and these shall not be changed except with the express permission of the Chief Inspector.
(2) No working shall be made within a distance equal to half the distance as specified incolumn (5) of table under sub-regulation (4) of regulation 99, corresponding to the depth ofthe seam being worked, of the boundary of any mine and in case of a disputed boundary noworking shall be made within the aforesaid distance of the boundary claimed by the owner ofan adjacent mine until such time as a binding agreement has been reached as to the correctboundary or the question has been finally determined by a court of law:

Provided that, where work is done in more than one seam, the barrier kept at the boundaryshall, as far as practicable, be vertically coincident and of the same dimensions.

122. Working near mine boundaries in opencast mines.– (1) The owner, agent or manager of every opencast mine shall have fixed boundaries of the mine and notwithstanding anything contained in sub- regulation (2), the boundary shall not be changed except with the previous permission of the Chief Inspector in writing and subject to such conditions as he may specify therein:

Provided that if any mine consists of two or more separate excavations and if, in the opinion of the Chief Inspector, they are not sufficiently near to one another to permit daily personal supervision beingexercised by one manager, the Chief Inspector may, by an order in writing, require the mine to be split into two or more separate mines.
(2) No working shall be made within a distance of 7.5 meters of the boundary of any mine and, in case of a disputed boundary, no working shall be made within a distance of 7.5 meters of the boundary claimed by the owner of an adjacent mine until such time a binding agreement has been reached as to the correct boundary or the question has been finally determined by a court of law: Provided that, where the workings of any mine, for any reason, are extended or get extended within any shorter distance than what is laid down herein above, the Chief Inspector may, by an order in writing, require the owner to construct such protective works within such time as he may specify in the order.

123. Strata Control and Monitoring Plan.– (1) (a)The owner, agent and manager of every mine shallprepare, formulate and implement a Strata Control and Monitoring Plan (SCAMP) based on scientific study considering the geotechnical data, information and the method of development and extraction of coal or the excavation required therefrom, which also includes a support plan to secure the roof and sides of belowground workplaces, and shall be subject to revision with change in condition, for all workingsbelowground.

(b)The owner, agent and manager shall submit a copy of the Strata Control and Monitoring Plan(SCAMP) to the Regional Inspector.

(2)The owner, agent and manager of every mine having workings below ground shall, beforecommencing any operation, frame, in consonance with the Strata Control and Monitoring Plan framedand with due regard to the engineering classification of strata, local geologicalconditions, system of work, mechanisation, and past experience, and enforce the support plan specifying inrelation to each working place the type and specifications of supports and their intervals.

(3)The manager shall, at least thirty days before the commencement of any operation, submit a copyof the support plan framed under SCAMP to the Regional Inspector who may at any time, by anorder in writing, require such modification in the plan as he may specify therein.

(6)The support plan shall include inter alia, system of, monitoring of the support performance,measurement of strata behaviour, re-setting of supports, provision of temporary support, replacement of oldsupports, withdrawal of supports and clearing of falls of ground.

(7)The support plan shall also include the implementation strategy of the plan, training and inspection and supervision policies.

(8)The owner, agent or manager shall formulate and implement a code of standing orders specifying –

(a)the system and the organisation for procurement and supply of supports of suitable material, of adequate strength and in sufficient quantity where these are required to be readily available for use;

(b)the method of handling including dismantling and assembling where necessary and transportation of the supports from the surface to the face and from the face line to their new site;

The strata monitoring plan referred under Para I above, shall be prepared based on the geo-technical studies by a scientific agency having expertise in this field and every such plan, shall, inter alia, include:-

1.0 Monitoring of gate roadways

1.1 Roof to floor convergence of tail and main gate roadways shall be monitored on regular basis by convergence indicators, once at least in every shift up to a distance of atleast 40m from the face at an interval not exceeding 10m.

1.2 Load cells shall be installed in main gate and tailgate roadways up to a distance of minimum 40 m from the face at an interval not exceeding 10 m on hydraulic/friction props or with the roof bolts as the case may be. Readings of the load cells shall be recorded in every shift.

1.3 The convergence measurements as required under clause no. 1.1 and load cell readings as required under clause no. 1.2 above shall be taken simultaneously.

1.4 If roof bolts are used as roof supports in gate roadways, at least 2 to 3 instrumented roof bolts shall be installed in each gate roadway at strategic places to determine the loading pattern on the bolts.

1.5 Multi point extensometers/ Tell tales/Sonic probe extensometers shall be installed in main gate and tail gate roadways at an interval not exceeding 50m to monitor dilation/ bed separation in the roof strata. The instruments shall be constantly maintained in the gate roadways of the panel at least upto a distance of 400 m from the face.

2.0 Monitoring of vertical induced stresses (abutment stresses) in barrier/chain pillars and longwall pillar

2.1 To predict abutment stresses in longwall pillar under extraction, stress cells shall be installed in the longwall pillar ahead of the face from main gate and tail gate roadways at an interval of 100 m. The stress cells shall be constantly maintained in the longwall pillar at least upto a distance of 400m from the face. The first stress cell shall be installed at the expected main weighting position.

2.2 To monitor the stability of the barrier/chain pillars and predict magnitude and location of the abutment stresses in it, stress cells shall be installed in the barrier/chain pillars from main gate and tailgate roadways at an interval of 200 m up to a distance of minimum 400 m from the face. The first stress cells shall be installed at the expected main weighting position.

3.0 Monitoring of load and convergence of Powered Roof Supports (PRS)

3.1 Pressure in the gauges fitted in leg circuits of the Powered Roof Supports (PRS) at the face shall be recorded once at least in every shift.

3.2 If there is no automatic continuous monitoring system of leg closure of PRS, measurement of convergence (leg closure) of the PRS shall be carried out by tape measurements at least once in every shift during idle period and daily once in other cases.

3.3 If there are no automatic continuous monitoring system of leg pressure and leg closure of PRS, the load on and convergence of at least 10 PRS at strategic locations shall be continuously monitored with data loggers to understand the loading pattern on PRS and its response.

4.0 Progressive caving of strata in the goaf

To study progressive caving behaviour of roof strata in the goaf with face retreat, at least three (3) multi-point Borehole Extensometers shall be installed from the surface along the central line of the longwall panel at not more than 500 m interval. In case of presence of goaved-out workings in the overlying seams vertically above the longwall panel, the location and interval between such Extensometers may vary to the extent that may be required to avoid drilling of boreholes through such goaved-out workings.

5.0 Subsidence study

Subsidence survey and maintenance of its records shall be done as per the DGMS circular no 4 of 1988 or its revised version.

5.0 If the roof strata of a longwall panel has been categorised as cavable with substantial difficulty or cavable with extreme difficulty based on Caving Index, the following additional precautions shall also be taken in the panel;

6.1 Continuous monitoring of strata shall be done using micro-seismic monitoring system with geophones installed from the surface to analyse the possible time of failure and location of the failure zones within the roof strata.

6.2 Leg pressures and leg closures of Powered Roof Supports (PRS) shall be monitored continuously by using real time monitoring and automatic data acquisition and interpretation systems.

7.0 In the proximity of the geologically disturbed areas of a longwall panel, during development (drivage of gate roadways and set up gallery) and salvaging of longwall panels the strata monitoring shall be carried out as per the instrumentation scheme suggested by the scientific agency referred under para-I above.

8.0 For every longwall panel, suitable trigger action response plans shall be formulated and integrated with emergency initiated protocols.

9.0 Plan: A part plan of the longwall workings depicting strata monitoring instrumentation with suitable index, shall be kept and maintained in the office of the mine.

10.0 Supervision

In every longwall panel, strata monitoring plan shall be kept under the charge of an Assistant Manager holding 1st Class Manager's Certificate of Competency with relevant experience in longwall, who shall also be assisted with adequate number of trained supervisors and manpower.

DGMS(S&T)/ (Tech.) Circular No. 01 of 2017 /Dhanbad, 17/05/2017

Standard Components and Properties of Rigid steel Props,Chocks & Cogs

1.0 Physical Properties

Manufacturer shall specify the steel grade and characteristics from which the steel support has been manufactured

a) Tensile strength of the steel grade used shall be at least 1.08 times the measured yield stress.
b) Elongation prior to fracture of the steel grade used shall not be less than 10%.
c) Manufacturer of the support shall specify design, calculations, Yield Strength and Ultimate Tensile Strength along with elongation at Yield and the factor of safety of the supports.

2.0 Chemical Properties

Chemical constituents of the steel:

Constituent	Max % by weight
Carbon	0.25
Sulphur	0.05
Phosphorus	0.05
Manganese	1.7
Other alloying/micro alloying elements	0.50

3.0 Physico-mechanical Properties

1. At least two prototype samples shall be tested for type test at national test house or laboratory.
2. 0.5 % of the production shall be subjected to routine test or production test.
3. Axial Load test.

The Steel Prop, Cog or Chock shall be set vertically in a testing machine and the designed load is applied. The load-yield characteristics shall be obtained.

4. Eccentric Load test

The test shall be conducted on the Square Steel Prop, Cog or Chock by putting the support with an eccentricity of about 54 mm at the upper end.

5. Overload test

An overload test shall be conducted by subjecting the Steel Prop, Cog or Chock to a load equal to 1.20 times the designed load. The test shall be conducted for at least five loading cycles.

Minimum performance requirements

There shall be no visible deformation, distortion or failure of any part of the support.

The minimum load bearing capacity of Steel prop shall be 20 tonnes and for Cog/Chock 30 tonnes.

4.0 Other Properties & Parameters

(a) Weatherability

The support and its components or parts shall be subjected to Accelarated Weathering Test in mine water condition for 20 days. No deterioration should occur on the Assembly.

(b) **Accelerated Weathering Test** shall also be conducted in acidic water condition for 20 days during which no deterioration should occur on the Assembly.

(c) **Corrosion Resistance Test** as per IS-5555: 1970

(Cir. Approval2/2010)

PAUL COMMITTEE REPORT

Guidelines for drawing up support plans in bord and pillar workings in coal mines.

Specifications for bolting systems

The length of the bolt should be at least one-third of the width of the roadway. However, the length should normally be not less than 1.5 m. For restricted height, coupled bolts would have to be used. A 20-22 mm diameter bolt (ribbed bar) will meet the requirements in most of the cases.

The bolting density for the three types of roof, where bolting has been recommended, will be as given below:

(i) Poor: 1.2 to 1.5 bolts/sq.m.
(ii) Fair: 1.0 bolt/sq.m.
(iii) Good: 0.7 bolt/sq;m.

At junctions, the density should be increased by **25%.** The bearing plates should be not less than 15 cm x 15 cm or equivalent area. The bolt angle should generally be normal to the bedding plane in rectangular roadways. The bolt angle should generally be normal to the bedding plane in rectangular roadways. The rib side bolts may in certain cases be inclined outwards.

Monitoring of support performance

With conventional free-standing supports there are clear indications when they carry excessive load. Roof bolts, however, give no visual indication of load increase and therefore no indication of how close either the individual bolt or the system is to ultimate failure. Failure of bolted roof can be more rapid and more extensive and with less warning than the failures experienced with conventional supports.

Systematic monitoring of roof bolted systems will therefore, be essential to assess the stability of the system and provide feedback which will allow future designs to be fine-tuned. Monitoring can be divided into broad categories, namely,

a) Measurement of bolt performance:

This is ascertained by anchorage capacity test (pull testing) conducted on about 10% of the bolts installed. A minimum of 5 tonnes anchorage strength should be achieved.

b) Measurement of strata behaviour:

The stability of the roadway should be monitored using sag indicators, sag bolts, bolt load-cells, convergence recorders, etc. For this purpose there should be a systematic plan of establishing monitoring stations both in active areas and in the permanent roadways outbye. Borehole extensometers for measuring strata dilation at different points along the roof may also be used where appropriate.

GUIDELINES FOR DRAWING UP SUPOPRT PLANS IN BORD & PILLAR WORKING IN COAL MINES

Rock mass classification systems which are particularly used to characterize mining ground conditions are :

Barton's Q-System

The Q-value gives a description of the rock mass stability of an underground opening in jointed rock masses. High Q-values indicates good stability and low values means poor stability.

$$Q = \frac{RQD}{J_n} \times \frac{J_r}{J_a} \times \frac{J_w}{SRF}$$

Where,

Jn = Number of joint sets

Jr = Joint roughness number

Ja = Joint alteration number

Jw = Joint water reduction factor

SRF = Stress Reduction Factor

RQD = Rock-quality designation (RQD) Rough is the measure of the degree of jointing or fractures in a rock mass

$$RQD = \frac{\text{sum of the length of all core pieces 10 cm or more}}{\text{the total core length}} x\ 100$$

RQD classification index

RQD	Rock Mass Quality
<25%	Very Poor
25-50%	Poor
50-75%	Fair
75-90%	Good
90-100%	Very good

Based on the value of Q, the rock mass can be described as "exceptionally good" (Q = 400 to 1000) to "exceptionally poor" (Q = 0.001 to 0.01). Using the Q value, the maximum unsupported span of a roof can be estimated by the formula:

Span (in m) = 2 X ESR X $(Q)^{0.4}$

Where ESR is excavation support ratio (which is 3 to 5 for temporary mine workings and 1.6 for permanent workings). The rock load (P_{roof}) can also be estimated from the empirical formula:

CMRS/ISM Geomechanics Classification

This is a practical rock mass classification system, specifically suitable for bord and pillar development roadways. The five parameters in this classification and their importance ratings are :

Parameters	Maximum Rating
Layer thickness	30
Structural features	25
Rock weatherability	20
Strength of the roof rock	15
Ground water seepage	10

The parameter values for the classification should be determined individually for all the rock types in the roof, up to a height of at least 2m.

1. Layer thickness

a. Drill 2m hole in the roof vertically.
b. Measure layer of thickness of each core.
c. Average of five values will give layer thickness and express it in cm.

2.Structural features

Random geological mapping should be carried out, and all the geological features (discontinuities, like joints, faults and slips, and sedimentary features like cross bedding, sandstone channels) should be carefully recorded. The relative orientation, spacing and degree of abundance for all these features should be noted. Their influence on gallery stability should be assessed, and the structural index for each feature should be determined from collected datas.

3.Weatherability

a) Take ten fresh irregular pieces of the sample (the total weight should be between 450 and 500 g)
b) place them in the test drum immersed in water, and rotate it for 10 minutes at 20 rmp;
c) dry the material retained in the drum and weigh it again.
d) Weight percentage of material remaining after the test will give slake durability index
e) Mean of three such first cycle values should be taken.

4.Rock strength

Point load test is the standard index test for measuring the strength of rocks in the field. Irregular samples having a ratio of 2: 1 for longer axis to shorter axis can be used for the test. The sample is kept between the pointed platens, and the load is applied gently but steadily. The load at failure (in kg) divided by the square of the distance between the platens (in cm) gives the point load index (Is). The mean of the highest five values out of at least 10 sample tests should be taken. The compressive strength of the rocks can be obtained from the irregular lump point load index for Indian coal measure rocks by the relation:

C_o (compressive strength)= 24 x Is (in kg/cm^2)

5. Ground water

a) Drill 2 m long vertical hole in the immediate roof
b) Collect the water seeping through the hole after half an hour.
c) The average of three values from three different holes should be taken and expressed in (ml/minute)

Rock Mass Rating (RMR) is the sum of the five parameter ratings. If there are more than one rock type in the roof, RMR is evaluated separately for each rock type, and the combined RMR is obtained as:

$$\textbf{Combined RMR} = \frac{\sum \text{(RMR of each bed X bed thickness)}}{\sum\text{(Thickness of each bed)}}$$

Adjustment : The RMR so obtained may be adjusted , if necessary , to account for some special situations in the mine like great depth stresses and method or work.

Adjustment Factors for RMR

	Adjustment to RMR	Adjusted RMR
1. ***Depth***		
Less than 250 m	Nil	RMR x 1.0
250-400m	10% reduction	RMR x 0.9
400- 600 m	20% reduction	RMR x 0.8
More than 600 m	30% reduction	RMR x 0.7
2. ***Lateral stress***		
Assumed stress amount		
Small	10% reduction	RMR x 0.9
Moderate	20% reduction	RMR x 0.8
High	30% reduction	RMR x 0.7
3. ***Induced stresses***		
Stress situation :		
No adjacent working in the same seam	Nil	RMR x 1 .0
Extraction area within 20-40 m in the same seam	10% reduction	RMR x 0.9
Extraction areas within 10-20 m in the same seam	Upto 30% reduction	RMR x (0.7 to 0.8)
Working above with 1 0-20 m parting	10% reduction	RMR x 0.9
Working above with 3 -10 m parting	Upto 30% reduction	RMR x (0.9 to 0.8)
4. Method of excavation		
Continuous miner	10% increase	RMR x 1.1
Undercut and blasting	Nil	RMR x 1.0
Blasting off -the-solid	10% reduction	RMR x 0.9
5. Gallery span		
Less than 4.5 m	Nil	RMR x 1.0
4.5-6.0 m	1 0 – 20% reduction	RMR x (0.8 to 0.9)

The final RMR for the roof is classified as :

RMR	Roof Class	Rood Description
0-20	V	Very poor
20-40	IV	Poor
40-60	III	Fair
60-80	II	Good
80-100	I	Very good

Relationship between RMR and rock loads is:

Rock load (tonnes/m^2) = span(m) X mean rock density x (1.7 -0.037 RMR +0.0002 RMR^2)

Recommended support system for development workings

Roof	**Bolling systems**	**Conventional supports**

description (class)		
1. Very Poor Roof (Class V)		(a) Yielding steel arches under high stress conditions, (b) Rigid steel arches under moderate stress conditions.
2. Poor Roof (Class IV)	(a) Full column grouted bolts using quick setting grout, supplemented with steel channel/w-strap. For flaky roof, wire mesh in addition. (b) For temporary roadways, roof stitching along with roof bolts and W-straps.	(a) Rigid steel arches for roof with structural disturbances, (b) Steel beam (200 mm x 100 mm) set on brick wall for permanent roadways (c) Steel bars set into pillars or on steel props.
3. Fair Roof (Class III)	(a) Full column grouted bolts using quick selling grout, (b) For temporary roadways, roof stitching supplemented by spot bolting in disturbed areas.	(a) Steel cross bars set into pillars or on steel props for permanent roadways. (b) Steel props for temporary roadways. Can also be used in permanent roadways.
4. Good Roof (Class II)	(a) Full column grouted bolts for permanent roadways, (b) Roof stitching with additional spot bolting in disturbed areas in permanent roadways.	Steel props for permanent roadways.
5. Very Good Roof (Class I)	No support except for spot bolting in disturbed areas.	

Table 5: Recommended support system for freshly exposed roof (upto 10 m from the face)

Roof description (class)	Bolting systems	Conventional supports
1. Very Poor Roof(Class V)		The system of support indicated in Table 4 should be erected closely following the face,
2. Poor Roof (Class IV)	(a) Point anchored (mechanical or grouted with quick setting resin) bolts for immediate tension, to be fully grouted soon afterwards, W- straps where necessary.(b) Full column grouted bolts with quick setting grout.	(a) Cross bars on steel chocks or hydraulic props with minimum 5 tonnes setting load.
3. Fair Roof(Class III)	(a) Combination bolts as at (a) above.(b) Full column grouted bolts with quick setting grout. (c) Recoverable, bolls.	(a) Light duly hydraulic props.(b) Steel props. (c) Triangular chocks at junctions. (d) Safari supports.
4. Good Roof (Class II)	(a) Recoverable bolts.(b) Full column grouted -bolts	(a) Steel props. (b) Safari supports.
5. Very Good Roof(Class 1)	No support except for spot bolting in disturbed areas.	

N.B.:

1. Grouted bolts also imply the use of cement capsules,
2. 'Quick setting' implies the development of an anchorage capacity of at least 10 kN in 30 minutes and about 50 kN in 2 hours.
3. Vertical supports should be set with minimum 5 tonnes setting load to prevent dislodgement due to blasting.
4. 'Very poor' and 'poor' roof should be supported as soon as it has been exposed.

(Cir. Tech 3/1993 & 6/1993)

Rock Load(te/m2) = rock density x gallery width($1.7-0.037RMR + 0.0002\ RMR^2$)

Support resistance =(no of roof bolts in a row x bearing strength of a bolt)/(load spacing x gallery width)

Standard Components and Properties of Steel Roof Bolts to be used in Mines

1.0 Physical Properties:

(a) Shape & Size:

The Roof bolt shall be of MS Steel or TMT Rebar having circular cross-section with ribs on circumferential region. The manufacturer of the roof bolt shall specify the design, calculations, Yield Strength and Ultimate Tensile Strength along with elongation at Yield and the factor of safety of the roof bolt manufactured by them.

(b) Length:

Length of the Roof Bolt shall not be more the designed length + 5mm.

(c) Diameter:

Diameter of the Roof Bolt shall not be more than the designed diameter ± 4% by mass.

(d) Straightness:

The roof Bolt shall be straight without any joint, welding, deviation or deflection. However if the deflection or deviation cannot avoided due to practical reasons, it shall not be more than ± 0.1 % per meter length of the bolt.

(e) Rib:

The Rib of the Roof Bolt shall be as per the design of the rib with an objective to maximize the surface area without reducing the core diameter of the roof bolt and having maximum grip with the grout.

2.0 Physico-mechanical Properties:

Steel for the Roof Bolt:

The roof bolt shall be of thermo-mechanically treated (TMT) rebar manufactured from MS Grade Fe-500, Fe-600 or above.Minimum load bearing capacity (Anchorage Load) of the roof bolt shall be 160 kN.

3.0 Chemical Composition:

Chemical constituents of the steel which influence the required properties of steel are carbon, sulphur, phosphorus, manganese and other alloying/micro alloying elements.

Thread on the Roof Bolt:

(a) The minimum length of the thread shall be 150 ± 5mm.

As a routine test, one thread in every 50 produced shall be checked using a go/no-go gauge.

(b) Non-threaded end

The non threaded end of the rock bolt shall be formed by cropping or sawing and shall be free from burrs and edges which protrude beyond the profile of the rock bolt.

As a routine, one rock bolt in every 200 produced shall be checked for straightness.

(c) The Nut shall be of hexagonal shape of thickness not less than 30mm.

(d) Pull Test: Thread and the Nut on the roof bolt shall be subjected to pull test which should not slip at the yield strength/load of the roof bolt.

Bearing Plate

(a) The Bearing Plate of the roof bolt shall be Dome Washer Plate of dimension 150 x150 x 8 mm with compatible central hole of required size and angled side toaccommodate the conical seat and nut.

(b) The minimum load at which the Domed Washer Plate will become flat should be atleast 14 Tonnes.

Conical Seat

(a) Conical Seat shall be of forged steel of required dimension

(b) The Conical Seat shall not deform at 1.20 times the Yield stress of the roof bolt.

Tensile Test of the Roof Bolt Assembly

(a) The Roof Bolt Assembly shall be subjected to Tensile Test and should not fail up to 16 Tonnes load.Subject to the condition that System Stiffness of the Roof Bolt assembly shall be within 20 KN/mm -System stiffness between 50 to 150 KN.

Other Properties & Parameters

(a) Weatherability:

The Roof Bolts and its components or parts shall be subjected to Accelerated WeatheringTest in mine water condition for 20 days. No deterioration should occur on the Assembly.

(b) Accelerated Weathering Test shall also be conducted in acidic water condition for 20days during which no deterioration should occur on the Assembly.

[Note: The AWT under mine water condition generally is at pH > 4 and that under acidic water condition is considered at pH-2 (5 % HCL aqueous solution) during testing. The test limit is that the loss of weight shall not be more than 5%]

(c) Corrosion Resistance Test:

The Roof Bolt Assembly shall also be subjected to Field Exposure and Corrosion Resistivity Test as per IS- 5555: 1970 to test the resistance to corrosion of the steel of the roof bolt and its parts. The Roof Bolt should pass the required test.

6.0 SAMPLING & TESTING

In order to check the composition and required parameters during manufacture, it shall be required that the random sampling be done at the rate of 2 roof bolts per 1000 pieces of roof bolts and its accessories manufactured in a batch which shall be subjected to the required set of tests In case the Roof Bolts or any of its accessories fail to pass the required tests at the user's end, that batch or lot of the manufacture shall not be used in the mine and intimation thereof shall be sent to the manufacturer.

(Cir. Tech approval 3/2010)

Revised standards for testing and use of Resin Capsules as grouting material for roof bolting in mines

Standard Parameters

Gel Time and Setting Time

Measured Gel Time and Setting Time of resin capsule shall conform to the standards as given below:

(a) Gel Time & setting time: • For Fast Set Type • For Slow Set Type	• 23 sec(min) to 54 sec(max) • 134 Sec(min) to 202 sec(max

Physico-mechanical properties

Physico-mechanical properties of resin capsule after setting shall conform to the following parameters and values.

1). Compressive Strength: (Applicable for slow-set type of resin only) • 30 min • 24 hours	• 30 MPa (min) • 80 MPa (min)
2). Bond strength test: • 30 min • 24 min	• 10 Tonnes • 15 Tonnes

(Cir. Tech 3/2010)

Revised Standard for Testing and Use of Cement Capsule as Grout Material for Roof Bolting in Mines

Physico-Mechanical Properties

(i) **Soaking Time in water**

The Soaking time of the cement capsule in water shall conform to the standard given below.

Parameter	Standard
Soaking Time	Max 3 min

(ii) **Initial Setting Time**

The initial setting time of the cement capsule shall conform to the standard given below.

Parameter	Standard
Initial Setting Time including Soaking time	Minimum – 5 Minutes Maximum- 10 Minutes

(iii) **Final Setting Time**

The final setting time of the cement capsule shall conform to the standard given below.

Parameter	Standard
Final Setting Time including Soaking & Initial Setting time	Maximum- 15 Minutes

(iv) **Compressive Strength**

The measured minimum Compressive strength gain of the cement capsule after completion of moulding for various time durations shall be as given below.

Parameter	Standard (MPa)
after30 minutes	≥3
after2 hours	≥7
after24 hours	≥12
after7 days	≥12
after21 days	≥12
after28 days	≥12

(v) **Anchorage Strength**

The measured minimum Anchorage Strength gain of the cement capsule after completion of grouting for stipulated time durations shall be as given below

Parameter	Standard (Tonnes)
after30 minutes	3
after2 hours	5
after24 hours	10
after28 days	12

(Cir. Approval 5/2010)

Extra Shots

REINFORCEMENT MECHANISMS OF ROOF BOLTS

The principal objective of roof bolting is to help the rock mass support itself. The degree of reinforcement required and the principal reinforcement mechanism depends on the geology and the stress regime.Four levels of support, each using a different support mechanism,can be identified

Simple Skin Control:Strong, massive roof subjected to low stress levels are mostly "self-supporting," that means a major roof collapse is unlikely to occur. However, cracks, joints, crossbeds, or slickensides can create occasional hazardous loose rock at the skin of the opening.So in this type of rock structure pattern bolting is required which binds cracks, joints etc and prevent local loose rock from falling.

Suspension:In this thin layers of weak, immediate roof are suspended from an overlying thick, strong unit that is largely "self-supporting".

Beam Building:Where there no "self-supporting" bed within reach, the bolts tie the roof together to create a "beam"

Supplemental Support Required:Where the roof is extremely weak or the stress extremely high, roof bolts alone may not be sufficient to prevent roof failure from progressing beyond a reasonable anchorage horizon. In these cases, cable bolts, cable trusses, or standing support may benecessary to carry the dead-weight load of the broken roof, and the roof bolts act primarily to prevent unravelling of theimmediate roof.

FMC Exam'14

What percentage of roof bolt shall undergo destructive test ?

a. 10
b. 1
c. 50
d. 5
e. 25

Ans : (b) 1

124.Setting of support – (1)(a) Every prop shall be set securely and on a sound foundation,shall be kept tight against the roof.

(2) Where a prop is set on sand or, other loose material, a flat base-piece not less than 5 cm in thickness 25 cm in width and 75 cm in length shall be used.

(3) The lid used over a prop shall have a width not less than the diameter of the prop, athickness not less than 8 cm and a length not less than 50 cm.

(6) In case of timber for erection of a cog, it shall be sufficient to joggle two opposite sides, provided that only four sides sawn sleepers shall be used for goaf edge supports in depillaring panels.

(7) The cogging members shall be not less than 1.2 m in length.

(8) Before erecting cogs in a depillaring area, props shall be erected at the corners of eachcog.

125. Withdrawal of supports – Whenever supports are to be withdrawn, the withdrawal shallbe done in accordance with the method which shall be specified in the Manager's StandingOrders. The standing orders shall cover –

(a) the supply and use of appropriate tools and safety contrivances;

(b) the setting of extra supports to control the collapse of roof from which supports are beingwithdrawn;

(c) the sequence of withdrawal of supports; withdrawal of a cog to precede withdrawal of itscorner props;

(d) safe positioning of the persons engaged in the operation and all other persons presentnearby;

(e) training of competent persons who are entrusted with the operations; and

(f) supervision during withdrawal of supports.

(3)In every mine where powered supports are used, it shall be the duty of the owner, agent andmanager to prepare a plan for the installation of powered supports and a plan for their withdrawal andtransport.The plan shall be reviewed and approved, with or without anynecessary amendment by the Regional Inspector before implementation.

127. Steep workings – (1) In workings having an inclination of 30 degrees or more from thehorizontal adequate precautions shall be taken to prevent danger to persons from falling orrolling of timber, tools or other appliances or material.

(2) No person shall work or be permitted to work at any place having an inclination of 45degrees or more from the horizontal, where he is likely to slip or overbalance, unless he issecured by a safety belt or life line or is otherwise safeguarded.

128. Fencings and gates – (1)(a) The top of every opencast working shall be kept securelyfenced.

(b) Where an excavation which has been formed as a result of any mining operation, extendswithin a distance of 15 m from a public road or any building, substantial fencing shall beerected and maintained around the excavation.

(c) Where as a result of mining operations, a subsidence of the surface has taken place or islikely to take place and persons are likely to be endangered thereby, the owner, agent ormanager shall keep the entire surface area securely and effectively fenced.

(2) Every entrance to a shaft, staple pit, sump, goaf or other dangerous place shall beprovided with an efficient fence, barrier or gate, so designed and constructed as to effectivelyprevent any person from entering or falling therein.

(3) Where a shaft or staple pit or a gallery having an inclination of more than 30 degrees fromthe horizontal leads directly into a working place or travelling roadway, such place or roadwayand any working place situated on its dip side, shall be securely guarded or otherwiseprotected as to prevent danger to persons from falling materials.

To prevent accident due to dump failure following measures should be taken:

i. A scientific study is to be made, in case the planned height of dump is beyond 30m. The width of any bench in waste dump shall not be less than its height.
ii. In case of existence of any road nearby dumping shall be done in such a way that the distance between toe of dump and the road is not less than twice the overall dump height.
iii. The top soil and sludge shall not be dumped at floor to create the base of the dump.
iv. For reducing the ground water pressure in the dump rock above phreatic surface, effective drainage system shall be provided both inside and outside the overburden dump.
v. Dumped area shall be substantially fenced according to CMR 112.
vi. Precautions shall be taken to prevent fire and spontaneous heating in the carbonaceous shale and coal dumped along with the overburden rock.

(Cir. Tech 03/2014)

129. Examination by Sirdars – 1) Every place in a mine, whether belowground or in opencastworking including travelling roadways and landings, where work is carried on or wherepersons are stationed or required to pass shall be placed under the charge of a sirdar or othercompetent person.

3(b)The sirdar or other competent person accompanied by such assistants as may berequired shall, within two hours before the connection of work in a shift, inspect every part ofthe mine or district assigned to him, in which persons have to work or pass during the shiftand all roadways and working places where work is temporarily stopped and shall ascertainthe condition thereof as regards ventilation, sanitation, the presence of gases, the state of theroof and sides, presence of spontaneous heating and other fire risks, and generally so far asthe safety of the persons is concerned. Similar inspections shall be made once at least inevery four hours during which the shift continues, of all the roadways and other workingplaces to which persons engaged in the mine or district are required to have access.

(7)In case of opencast workings, the sirdar shall pay attention to overhangs, undercuts, presence of

loose stone, materials or trees, etc., within 3 meters of the edges, foot paths for traveling and carrying loads,fencing on top of the quarry and disused part or abandoned quarries, fencing along footpaths and benches where required, use of personal protective equipment and condition of dumps.

131. Working at height.- –(4) No person shall work or travel on any ledge or footpath less than 1.5 metres wide, from which he will be likely to fall more than 1.8 metres, unless he is protected by guard rails, fence or rope suitably fixed and sufficiently strong to prevent him from falling.

132. General precautions (5) No person shall carry or be permitted to carry any load along a road or footpath having an inclination of 30 degrees or more from the horizontal.

(6) Every road or footpath, along which loads are carried by human agency, shall comply withthe following requirements -

(i) its breadth shall not be less than one metre; and

(ii) at every place where the inclination exceeds 15 degrees from the horizontal, levelsteps shall be provided such that the vertical height of every step does not exceed0.18 m and the distance from the edge. To the back is not less than 0.35 m.

MULTIPLE CHOICE QUESTIONS

Mine Workings

1. Why rectangular pillar is preferred over square pillar in case of board & pillar working?
    a) Factor of safety is more
    b) For higher production
    c) Designing of rectangular is easy
    d) For better ventilation
2. In a development work, height and width of gallery shall not exceed_____ & _________ respectively
    a) 4.8 m , 3 m
    b) 3 m , 4.8 m
    c) 4.2 m , 3 m
    d) 3 m , 4.2 m
3. No haul road shall have gradient steeper than____
    a) 1 in 14
    b) 1 in 15
    c) 1 in 16
    d) 1 in 10
4. According to DGMS circular maximum speed of dumper shall be restricted to ______
    a) 25 km/hour
    b) 30km/hour
    c) 20 km/hour
    d) 40km/hour
5. According to DGMS circular stability test of Heavy earth moving machinery shall be carried out once at least in a _________
    a) One year
    b) 6 months
    c) 3 months
    d) 5 year
6. According to DGMS circular for a roof of RMR 35, what shall be the threshold values of vibration in ppv (mm/s) for the safety of roof in below ground working ?
    a) 50
    b) 50-70
    c) 70-100
    d) 100-120

7. According to DGMS circular for a roof of RMR 35, what shall be the threshold values of vibration in ppv (mm/s) for the safety of pillar in below ground working ?
    a) 20
    b) 20-30
    c) 30-40
    d) 40-50
8. For depillaring operation permission has to be sought from________
    a) Regional Inspector
    b) Chief Inspector
    c) Regional Inspector or Chief Inspector
    d) Regional Inspector & Chief Inspector
9. According to DGMS circular depillaring should cover areas sufficiently large to last for a period of at least________
    a) 5 year
    b) 10 year
    c) 3 year
    d) 20 year
10. According to DGMS circular application for permission for depillaring should be required to be submitted to DGMS at least____________ in advance of the proposed date of commencement of depillaring operation.
    a) 30 days
    b) 3 months
    c) 6 months
    d) 15 days
11. What shall be the minimum thickness of explosion proof stopping in case of 3rd degree gassy mine where stowing is carried out?
    a) 1 m
    b) 0.5 m
    c) 38 cm
    d) 25 cm
12. Provision of extraction of coal by method other than board & pillar system is given under section __________ of CMR'2017.
    a) 100
    b) 113
    c) 103 A
    d) 99
13. Length of roof bolt shall not be more than the designed length by ________
    a) 30 mm
    b) 5 mm

c) 10 mm
d) 50 mm

14. Contravention of any provision of regulation found by inspector during inspection of mine shall be entered in ____________.
a) Form 3 of third schedule
b) Form 6
c) Form IV
d) Form 5

15. Two seams are said to be contiguous when they lie within ____________ of each other.
a) 9 m
b) 10 m
c) 7.5 m
d) 15 m

16. No working shall be made within ____________ of any railway.
a) 45 m
b) 60 m
c) 15 m
d) 30 m

17. Permission to work within 45 m of any road may be granted by ________
a) Regional Inspector
b) Chief Inspector
c) Regional Inspector or Chief Inspector
d) Regional Inspector & Chief Inspector

18. What should be the minimum load at which the domed washer plate will become flat?
a) 12 tonne
b) 20 tonne
c) 14 tonne
d) 16 tonne

19. What should be the minimum anchorage strength gain of cement capsule after 2 hours?
a) 8 tonne
b) 10 tonne
c) 12 tonne
d) 5 tonne
a)

20. What shall be the roof bolt density in case of fair roof?
a) 1.2-1.5 bolt/m^2
b) 0.7 bolt/m^2

c) 1 bolt/m^2
d) 2bolt/m^2

21. The length of roof bolt should be at least ____________ of the width of the roadway.
a) 1/2
b) 1/4th
c) 1/3rd
d) 3/4th

22. What is the RQD of that whose length of core pieces after drilling are 9 cm , 15 cm, 20 cm , 6 cm ?
a) 90%
b) 40%
c) 50%
d) 70%

23. What will be the rock quality in the above case ?
a) Very poor
b) Fair
c) Good
d) Very good

24. A roof consist of layer of sandstone and shale having thickness 30cm & 50 cm.Their RMR are 50 & 30 respectively. What will be the combined RMR of the roof ?
a) 80
b) 40
c) 37.5
d) 30

25. RMR of a rock is 40.What will be the adjusted RMR of the rock at a depth of 500m ?
a) 36
b) 32
c) 24
d) 28

26. RMR of a rock is 40. What will be the adjusted RMR of the rock when working is to be carried out by the continuous miner?
a) 40
b) 36
c) 44
d) 32

27. What will be the roof class and quality of the roof having RMR 44.
a) III, Fair
b) IV, Poor
c) II , Fair
d) III, good

Answers

1.a 2.b 3.c 4.b 5.a 6.b 7.b 8.a 9.c 10.b 11.a 12.b 13.b 14.b 15.a 16.a 17.b 18.c 19.d 20.c 21.c 22.d 23.b 24.c 25.d 26.c 27.a

Precautions against dangers from Fire , Dust , Gas and Water

133. Classification of Coal seams according to their degree of gasiness –(2) .If in a gassy seam the percentage of inflammable gas in the general body of air or the rate of emission of such gas increases so as to bring that seam into a higher degree of gassiness, the owner, agent or manager shall **within 24hours** from his knowledge of such increase, inform the RI and also observe all the precautions required to be taken under these regulations in respect of a gassy seam of that degree. **The RI shall within 30 days** of the receipt of such information verify the degree of gassiness by suitable investigation and classify the seam into the appropriate degree of gassiness:

Provided that if it is not practicable to observe all the precautions required to be taken under these regulations within 24 hours as stipulated in the sub-regulation, the RI on a request in writing by the owner, agent or manager may defer the observance of the required precautions, subject to such conditions as he may specify for a **period not exceeding 60 days.**

(3) If in a gassy seam the percentage of inflammable gas in the general body of air or the rate of emission of such gas decreases so as to bring that seam into a lower degree of gassiness, the owner, agent or manager may inform the RI of the same. The **RI shall within 30 days** from the receipt of such information verify the degree of gassiness by suitable investigations and classify the same into appropriate degree of gassiness. Till such time the RI so classifies all the precautions required to be observed previously shall be observed.

(4) Notwithstanding anything contained in sub-regulation (2) or (3) the Regional Inspectormay at any time make investigations and reclassify a gassy seam into the appropriate degreeof gassiness.

(5) The owner, agent or manager shall **at least once in every 30 days** examine the rate of emission of inflammable gas in cubic m per tonne of coal raised and the percentage of inflammable gas in the general body of air as laid down in regulations 145.

***general body of air** means the general atmosphere in a seam and includes theatmosphere in the roof cavities, but does not include general atmosphere in the sealed offarea or in any borehole drilled in coal or in the adjacent *strata.*

Determination of Rate of Emission of Inflammable Gas per tonne of coal for the purpose of classification of Gassy Seams

1. Place and time of collection of air samples

(a) The air samples shall be collected at the following points:

(i) at the outbye end of the return airway of every ventilating district;

(ii) at the outbye end of main return

(b) The samples shall be collected during coal getting operations when the emission of gas is likely to be the maximum taking into account the method of extraction.

2. Method of collection of air samples

Air sample shall be collected over the entire cross sectional area of the return airway moving the sampling bottle more or less in the same manner as an anemometer is moved during an air measurement.

3. Analysis of air samples

Two air samples shall be analyzed for inflammable gas as early as possible but definitely within 4 days of collecting them. (CM) Now 48 hours.

5. Calculation for determination of rate of emission of gas

Make of inflammable gas(m^3/min) G	=	$\frac{\text{Quantity of air (m}^3\text{/min)} \times \text{Percentage of inflammable gas}}{100}$
Rate of emission of inflammable gas (m^3/te) of coal produced	=	$\frac{G \times 60 \times 24}{\text{Output of coal in tonnes during the day}}$

Gas Survey In First Degree Gassy Seams

1. General

Determination for presence of inflammable gas shall be made in General Body of Air and in Boreholes. Detection of inflammable gas in borehole provides a valuable guidelines as to how a seam is potentially behaving in respect of gassiness and therefore due importance to gas survey in boreholes should be given.

2. Procedure

(a) General Body of Air- Sample of air shall be taken from the following vulnerable point:

(i) cavities

(ii) blind headings both in working and disused areas

(iii) places in the vicinity of faults, dykes and other geological disturbances

(b) Boreholes

(i) For the purpose of gas survey, boreholes shall be drilled at a number of active development faces or in the pillar sides adjacent to same, so however that atleast one set of boreholes shall be put in a block of coal measuring 45m x 45m. A set of boreholes (one metre) apart in vertical plane) so positioned as to intersect almost the whole of the working section of the seam. When thickness of seam is more than the working height, additional borehole(s) shall be drilled in the roof and/or floor coal, as the case may be.

(ii) Air samples shall be taken from inside the boreholes put in as mentioned above specially drilled for the purpose. These boreholes shall be drilled by electric drills atleast 1.5m long and slightly rising. They shall be kept effectively plugged for not less than 60 minutes before collecting samples.

(iii) Air samples shall again be collected from the same borehole after keeping them plugged for 7 days.

3. Periodicity

(a) Initially, in every seam as soon as it is opened or reopened

(b) While approaching within 30 meters of a fault plane, dyke or other geological disturbances.

(c) Determination in general body of air shall be made at least once in 30 days. Borehole samples shall be collected at suitable intervals to be fixed by the manager, but not less than once in a quarter. 3 months.

(Cir. Tech 6/1976)

135. Surface precautions against fire- (1) **All surface structure and supports within a horizontal distance of 10 meters** from all entrance to a mine shall be of fire proof material:

Provided that this sub-regulation shall not apply to temporary structures, supports and coverings at the top of a shaft which is in the course of being sunk.

(2) Shale or other carbonaceous material shall not be heaped or dumped, and dead leaves or dry vegetation shall not be allowed to accumulate or remain, and combustible material other than materials required for use within a period of 24 hours, and inflammable material shall not be stored , within a distance of 15 m from any entrance to mine, which is not effectively sealed off from the workings belowground:

Provided that nothing in this sub-regulation shall prevent the dumping of coal raised from the mine near the entrance of the mine.

(5) No person shall light a fire or permit a fire to be lighted in any opencast working within adistance of 15 m from any entrance to a mine, except by the permission in writing of themanager and only for a special purpose specified in such order.

(6) A competent person shall, once at least in every seven days, inspect the top of allentrances to a mine, all opencast workings and any ground broken by extraction of coal inorder to ascertain whether the precaution laid down in this regulation have been compliedwith, and for the presence of any fire that may have broken out or any indications thereof.

Extra shots

Type of Fires

Class A

Class A fires are fires in **ordinary combustibles such as wood, paper, cloth, trash, and plastics.**

Class B

Class B fires are fires in **flammable liquids such as gasoline, petroleum oil and paint**

Class C

Class C fires are fires involving **gaseous fuels like LPG gas, butane etc.**

Class D

Class D fires are fires in **combustible metals** such as **potassium, sodium, aluminum, and magnesium.**

Class E

Class E fires are fires involving **energized electical equipment** such as **motors, transformers, and appliances.**

136. Underground precautions against fire –(3) No person shall light a fire or permit a fire to be lighted in any workings belowground :

Provided that –

(a) in the case of a gassy seam of the first or second degree, flame or electric welding or repairingapparatus may be used belowground if permitted by an order in writing of the manager and every such order shall specify the person who shall be in-charge of the apparatus; and it shall be the duty of such person to bring the apparatus back to the surface when no longer required belowground; and

(b) in the case of a gassy seam of the third degree, a flame or electric weldingor repairing apparatus may be used belowground if prior permission inwriting has been obtained from the **Regional Inspector** and subject to suchconditions as he may specify therein

(5) All unused workings connected to the surface through a walk able entrance which is notpermanently closed, shall once at least in every **30 days** be inspected by a competent personfor signs of illicit distillation of liquor.

137. Precaution against spontaneous heating -The following furtherprecautions shall be taken against the danger of spontaneous heating :

(1)(a) The seam or section shall be worked in panels having independent ventilation in such amanner that it is possible to isolate one from another easily if necessary.In determining the size of the panel due consideration shall begiven to the desirability of enabling complete extraction of the pillars therein **within the incubation period** of the coal.

(b) No coal, shale or other carbonaceous material shall be left or stacked belowground.

(c)Except where otherwise permitted by the Chief Inspector by an order in writing and subjectto such conditions as he may specify therein, no extraction of pillars in any seam or sectionshall be commenced until fire dams or stoppings have been provided in all entrance to thepanel, except that in the fire dams or stoppings built in entrances which are to be kept openfor ventilation or haulage suitable doors or openings may be left and bricks and other suitablematerials shall be kept readily available their vicinity. Shale or other carbonaceous materialshall not be used in the construction of fire dams or stoppings;

(d) A panel be isolated by adequate stoppings as soon as it has been goaved out.

(2) Sufficient material for dealing with fire shall be kept in readiness at suitable placesbelowground for transport and use.

(3)(a) In order that spontaneous heating is detected in early stages, the air in the returnairway of every depillaring district, and of every goal which has not been isolated, shall be;

(i) tested for percentage of carbon monoxide once at least in every seven days with anautomatic detector of a type approved by the Chief Inspector; and

(ii) completely analysed once at least in every 30 days with a view to determining the ratio CO formed/O_2 absorbed.

(18) Hydraulic fluid which is not fire resistant shall not be used belowground.

(19) Precautions shall be taken to minimise the possibility of hydraulic fluids or oils coming in contact with hot surface, electrical apparatus or cables.

(20) Combustible oils or material shall not be used for filling in electrical equipment.

(21) Regional Inspector may by an order in writing, exempt from use of fire resistant hydraulic fluid in degree-I gassy mine subject to such conditions as he may specify therein.

Extra Shots

Grahm's ratio

The production of CO in relation to the oxygen consumed by the oxidized material is a function of temperature and therefore indicates the average intensity character of a fire.

Grahm's ratio $= \dfrac{\text{CO formed}}{O_2\ \text{Used}}$ or $\dfrac{\text{CO formed}}{0.265\ N_2 - O_2}$

Methods of finding Graham's Ratio

1) Haldane apparatus

2) Analysis of Air sample

As a thumb rule it can be taken that:

- **0.4 per cent or less indicates normal value.**
- **0.5 per cent indicates necessity for a thorough check-up.**
- **1 per cent indicates existence of heating.**
- **2 per cent indicates serious heating approaches active fire.**
- **3 per cent and above indicate active fire with certainty.**

Values of Graham's ratio ≥ 7 may occur for blazing fire. With rise in intensity of the fire the ratio may evengo up to as high as 10 per cent or more due to formation of water gas (CO and H_2) or producer gas (CO and N2).This ratio has the significant advantage that it is almost independent of dilution by leakage of air as this effectsboth numerator and denominator equally.

This ratio possess the following disadvantages:

- The absence of CO is not a safe criterion that a fire has been extinguished but rather than active combustionhas ceased.
- CO may be lost due to dilution, oxidation by wet coal or bacteria or it may not diffuse throughout the entirearea.
- In some cases the CO produced by normal oxidation in goaves or wastes may not disappear at all or fall ata very slow rate.
- If the oxygen deficiency is less than 0.3 per cent.
- Finally, it will be affected by sources of carbon monoxide other than the fire, i.e. if the air supplied to thefire is not fresh. This can occur if the fire is fed, partially, by air that has migrated through old workingsand contains blackdamp (deoxygenated air).

Grahm concluded that early detection of heating is best obtained by watching carefully CO/O_2 deficiency ratio. Whereas the change from heating to actual fire is shown by higher values of young's ratio.

Young's Ratio

$$\text{Young's Ratio} = \frac{CO_2 \text{ formed}}{O_2 \text{Used}} \quad \text{or} \quad \frac{CO_2 \text{ formed}}{0.265\, N_2 - O_2}$$

As the fire progresses from smouldering to open flame, the burning of carbon monoxide will produce anincrease in carbon dioxide. Hence, a simultaneous rise in $[CO_2]/\Delta O_2$ and fall in $[CO]/\Delta O_2$ indicates further developmentof the fire. If the value of this ratio is below 25 it is considered to beindicative of superficial heating. If it is more than 50 it should be corroborated with other fire indices to rule outor confirm a high intensity fire.

This ratio suffers from various limitations:

- Its accuracy becomes suspect if very little oxygen has been consumed, i.e. the oxygen deficiency isless than 0.3 % .
- The concentration of carbon dioxide may have been influenced by adsorption, its solubility in water, strataemissions of the gas and other chemical reactions.

Willett's Ratio

$$\text{Willet Ratio} = \frac{CO_2 \text{ Formed}}{\text{Black damp + Combustible Matter}}$$

This ratio is applicable to the specific situations where there is a higher than usual evolution of carbon monoxide by ongoing low temperature oxidation. This ratio can be used as a criterion of progress towardsthe extinction of fire behind the seals under circumstances where the Graham's index does not apply. Itmay be pointed out here that the absolute figures vary from

seam to seam and even from district to district, thusit is only the trends that can be universally applied. Some researcher emphasized that the constancy of the Willett's ratio is not an indication that a fire is extinct but only that the fire activity has greatly decreased. He inferred that $[CO]/[CO_2]$ ratio is more relevant in this regard.

CO/CO_2 Ratio

This ratio, $[CO]/[CO_2]$ of products of combustion may be considered to attain an equilibrium in a particular combustion situation. It indicatesthe completeness of the combustion or oxidation. If the value of this ratio is more than 2 per cent it indicatesactive fire in the adjacent zone. If the value of this ratio is equal to or more than 13 it indicates a blazing fire. This ratio has the significant advantage that it is unaffected by inflows of air, methane or injected nitrogen. It is,however, subject to variation in carbon monoxide and carbon dioxide that are not caused by fire. Limitations arechances of appearance of blackdamp and disappearance of CO_2 (dissolution in water, etc.) in mines. Generallythe $[CO]/[CO_2]$ ratio is a more sensitive indicator than the $[CO]/\Delta O_2$ ratio for determining the state of a coal mine fire, since the former is more sensitive to temperature. However the $[CO]/\Delta O_2$ ratio is widely accepted forearly detection of coal fire, largely because of the availability of CO field sensor as compare to CO_2 sensor.

Jones and Trickett Ratio

$$\text{Jones and Trickett Ratio} = \frac{[CO_2] + 0.75[CO] - 0.25[H_2]}{\Delta O_2}$$

serves as an indicator of the type of fuel involved in any fire orexplosion. Jones and Trickett developed this ratio for determining whether methane or coal dust has been involved in a mine explosion. Its value ranges between 0.4 to 0.5 if methane is involved; 0.5 to 1 for coal, oil orconveyor belt and 0.9 to 1.6 for timber. It is an indication of extinguishment or greatly reduced coal temperatures,if the value is less than 0.5.

(c) Every depillaring district shall be inspected on every idle day, and all unused workings which have not been sealed off shall be inspected once atleast in every **seven days**, by a competent person for any fire risk.The isolation stoppings built around goaved out areas shall be inspected at similar intervals.

Telemonitoring systems and their features for use in Under Ground Coal Mines

Telemonitoring system is used for continuous monitoring of inflammable/toxic gases, air velocity etc.

1. Basic components of a telemonitoring system:

- Audio visual warning device
- Surface monitoring system for display, storage and retrieval of readings
- Power supply system
- Electrical power tripping arrangement
- Connected data transmission cables

2. Various parameters of the sensors:

(a) Minimum operating life of the sensors shall be as follows.

Sensor type	Operating Life
CH_4(Infra-red)	5 years
CH_4(Catalytic)	2 years
CH_4(Electro-chemical)	2 years
CO	2 years
O_2	1 year

(b) Working limit of temperature – Not more than 50°C

Working limit of humidity - Upto 100%

(c) Calibration

(i) Deviation of the measured gas concentration shall not be more than 3% for all sensors types when tested with standard gases.

(ii) Interval of calibration of the sensors shall not exceed 3 months, alternating between the OEM and the user. However OEM shall examine the telemonitoring system totality atleast once every 6months.

3. Minimumrequired power back up in case of power failure shall be for a period of four hours.

4. Alarm system: Minimum intensity of the audio part of the audio-visual alarm provided with the telemonitoring system shall be 90 dB(A).

138. Precautions after a fire has broken out-(1) (a) On the appearance in any part of a mineof smoke or other signs indicating that a fire or spontaneous heating has or may havebroken out, all persons other than those whose presence in the mine is deemednecessary for dealing with the fire or heating shall be immediately withdrawn from themine. No person, other than those required for dealing with or sealing off the fire orheating, shall be admitted in the mine until the fire or heating has been extinguished oreffectively sealed off and an examination has been made by the manager or by theassistant manager or underground manager and the mine has been declared to be safe.

(b) The examination required by clause (a) shall be made with an approved flame safetylamp and other means of detecting carbon monoxidegas approved by the Chief Inspector.

(2) During the whole time that any work of dealing with or sealing off a fire or heatingbelowground is in progress –

(a) a competent person shall be present on the spot throughout.

(b) adequate precautions shall be taken to prevent danger to persons from any noxious asphyxiating or inflammable gases, flame, steam and ejected or rolling down hot material ; explosion of water gas and falling into crevices pot holes that may occur in the area on fire;

(c) there shall be kept available, at or near all places belowground:

(i) adequate number of self-rescuers and at least two smoke helmets orother suitable apparatus for use in emergency;

(ii) a cage containing suitable birds or other means of detecting carbonmonoxide gas approved by the Chief Inspector; and

(iii) a flame safety lamp or other means of detecting carbon dioxide gas andoxygen deficiency, approved by the Chief Inspector.

(3) The manager of every mine shall prepare and establish a detailed scheme for the provision and maintenance of suitable fire fighting arrangement for the prevention, detection, dealing and control of any heating of fire; for the examination and maintenance of the protective measures taken to control or isolate a fire or heating and for ensuring safety of persons engaged in the said operation.

(5)The manager of every mine shall prepare and establish a detailed scheme for-

(a)the provision and maintenance of suitable fire-fighting arrangements;

(b)the prevention, detection, dealing and control of any heating or fire;

(c)the examination and maintenance of the protective measures taken to control or isolate a fireor heating;

(d)ensuring safety of persons engaged in the said operations,and the scheme shall be suitably modified and kept updated as the situation warrants.

139. Equipment for fire-fighting – (1) In every mine:

(c) sufficient supply of sand or in combustible, dust or suitable portable fire extinguishersshall be provided at:

(i) every entrance to a mine or district and at every landing and shaft bottom in use;

(ii) every place where timber, grease, oil or other inflammable material is stored;

(iii) every engine room, electrical gear, driving unit of roadway conveyor, diesel engine maintenance workshop and filling station storage battery charging station;and

(iv)on every track-mounted and trackless locomotive, self propelled manriding car and personnel carrier;

(v)each permanent and temporary electrical installation;

(vi)at locations where welding, cutting or soldering with arc or flame is being done;

(vii)every machinery, plant and installations; and

(d)every heavy earth moving machinery used in opencast workings shall be provided withautomatically operated fire detection and suppression device or system:

Provided that in case of trucks and dumpers of less than 35 tonne capacity used in opencast mines,it may be sufficient if semi-automatic type fire suppression system has been provided;

(e)specially designed water foam spray, deluge systems or dry chemicals shall be installed above eachbelt drive, belt take up, electrical control, gear reducing unit and other strategic locations on theconveyor belt system;

(f)adequate number of suitable fire extinguishers or automatically operated fire suppression devicesshall be provided on continuous mining machines, other face cutting machines, loading machines,roof bolting machines and other hauling machines.

(iv) such other special places of fire risk as may be specified by the manager.

(d) an upto-date fire-fighting plan showing the water mains, taps, fire-stations, pumpingstations, ventilation system, escape route etc. shall be kept maintained and a copythereof posted in the mine office and a convenient places belowground

(2)(a) Soda-acid type extinguishers or water shall not be used for fighting oil or electrical fires.

(b) Foam type extinguishers shall not be used for fighting electrical fires.

(c) Fire-extinguishers containing chemicals which are liable, when operated, to give offpoisonous noxious gases shall not be provided or used belowground:

Provided that nothing in this clauses shall be declined to prohibit the use belowground fireextinguishersgiving off carbon dioxide when operated.

(5)All types of fire fighting and fire suppression systems including automatic fire detection andsuppression systems to be used in machinery and plant including heavy earth moving machineries,materials and chemicals to be used in fire sealing, fighting or suppression systems in mines both on surface as well as belowground shall be of such type, standard and make, as approved by the Chief Inspector by a general or special order.

Carbon dioxide gas or other dry powder appliances should be used for fighting electrical fires.

(Cir. 21/1960)

The manager of every mine should draw up Standing Orders laying down the procedure to be adopted for giving warnings of fires, for withdrawal of personnel from the mine and for the conduct of firefighting operations. The standing order should be sent to CI for his approval.

(Cir. 2/1960)

A Handheld High Pressure Water Mist cum CAF (Compressed Air Foam) based fire fighting system can quench oil fire as well as electrical fire upto 36 kV live.

(Cir. Tech 3/2009)

(3)(a) A competent person shall, once at least in every month, examine all the equipment,material and arrangements provided for fire-fighting and shall discharge and re-fill the fireextinguishersas often as may be necessary to ensure that these are in proper working order.

140. Organisation for fire fighting.–(1) The owner, agent and manager of every mine shall establish aproper organisation for fire fighting in the mine by installing fire stations at surface and also on every mainhaulage roadway belowground at suitable places in the intake airway near the main shaft with adequate fire fighting equipment kept in every such fire station.

(2)Sufficient number of plans shall be prepared showing the fire fighting equipment including thewater mains, taps, fire-stations, pumping stations, ventilation system and escape route alongwith containing such other information as may be useful for the purpose of fighting fires, and up-to-date copies of these plans shall be kept available at suitable places both on the surface and belowground.

(3)Adequate number of persons, including all operators of plants, machinery and heavy earth movingmachineries, shall be trained in the use of fire-extinguishers and in fire fighting and such persons shall be made familiar with the position of all fire fighting equipment provided in the mine in general and near their places of work in particular.

(4)The manager of every mine shall, with the approval of the Regional Inspector, frame standingorders containing the procedures that may be adopted in giving warnings of fire, timely withdrawal ofpersonnel from the mine and for the conduct of fire fighting operation

CMR 141 Apparatus for testing for Carbon Monoxide

List of approved apparatus for detecting CO gas are :

1. 'P.S.' Carbon Monoxide Detector
2. M.S.A. Colorimetric tester
3. TX11 Carbon Monoxide Detector
4. CO-Detector (Aspirator) and tubes

(Cir. 18/1958)

Recalibration of direct reading CO detectors should not exceed four months.

(Cir. Tech 1/1992)

Callibration of Methanometer , toximeters, Oxymeters, Multigas Detectors shall be done every 3 months.All other equipment – every 6 months

(Cir. Tech 9/2002)

142. Precautions when a fire exists –(1)No person shall be employed in any seam –

(a) where a fire or spontaneous heating exists in a lower seam whether such fire has beensealed off by means of fire stoppings or not; or

(b) where the seam has a common ventilation system with another seam on fire; or

(c) where the outlets of openings of the seam are within 60 m of an active fire or spontaneous heating in a higher seam or on the surface in any ash heap or spoil heap orin any other heap or place or any other fire or spontaneous heating which cannot becontrolled immediately or where broken ground connected with the seam exists within 60m of such fire or spontaneous heating; or

(d) where the parting with an overlying seam on fire or in which spontaneous heating hastaken place; or with surface containing an active fire or spontaneous heating in any spoilheap or ash heap or in any other heap or place; or any other fire or spontaneous heatingwhich cannot be controlled immediately, consist of less than 10 m of hard rock except with the permission in writing of the Chief Inspector and subject to such conditions as he may specify therein.

(2) In any working mine, in which a fire is known or believed to exist –

(a) adequate precautions shall be taken to prevent the passage of air, from any part of themine or from the surface, into the fire area through any broken strata.

(b) No work other than the operations required by clause (a) shall be done in any part of themine which is not effectively sealed off from any such goaf or broken strata.

(3) In every coal seam, arrangements shall bemade once at least every 30 days to ascertain the atmospheric condition behind thestoppings.

(4) (a) Every stopping erected to isolate or control a fire or spontaneous heating belowgroundand shall be of adequatestrength and so maintained as to prevent any leakage of air or gas through it. Where water islikely to accumulate behind any such stopping there shall be provided in the stopping asuitable pipe or other device to drain away the water without permitting any leakage of air orgas, etc.

(5) A competent person shall, once at least in every seven days, inspect all stoppings erectedto isolate or control a fire or spontaneous heating belowground. During every such inspection,he shall ascertain the general condition of every stopping, check it for leakage and presenceof gas, and ascertain the temperature and humidity of the atmosphere outside the stopping.

fiery seam means a seam in which a fire or spontaneous heating exists in theworkings below ground or in open cast workings lying within the precincts of a mine.

143. Precautions against dust-A place shall not be deemed to be in a harmless state for person to work or pass or remain therein if the eight hours time-weighted average concentration of airborne respirable dust in milligrams per cubic meter of air sampled by an approved dust sampler,exceeds two, where working is being made wholly in a coal seam or where free respirable silica present is less than five percent. and the value arrived at by dividing the figures of ten with the percentage of free respirable silica present in other cases.

Procedure for conducting air-borne respirable dust surveys

G.S.R. 978(E) 1/10/2018

1.0 Instruments and Accessories

- Instrument to be used for Air-borne dust survey – MRE 113A
- The balance to be used for measuring the weight of dust filters before and after sampling should be very sensitive and capable of weighting upto one hundredth of a milligram and it should be maintained properly 100 mg
- Calibration The sampling instrument and the balance shall be calibrated as per manufacturer's instructions but on a date, which is not later than one year. 1 Y

2.0 Laboratory for determining dust content- Respirable dust content or the quartz content shall be determined within 14 days of collection of the dust sample at an approved laboratory. Determination of quartz content shall be made at-least once for each seam being worked in the mine and when there is substantial change in the coal property in the working section of the seam. 14 D

3.0 Air-borne Dust Survey In-charge Air-borne dust survey in a mine shall be conducted by a suitable person, designated as Air-Borne dust Survey In-charge.Manager of every mine shall appoint an **Air Borne Dust Survey In-charge,** having minimum qualification and experience as mentioned below and trained as per the training schedule given below for the purpose of carrying out air-borne dust survey in the mine.

3.1 Minimum qualification : Holder of Overman's Certificate of Competency(Coal). OM

3.2 Experience : Minimum three (03) years as overman including minimum one year in that mine. 3 Y 1 Y

3.3 Training of air-borne dust survey incharge :

3.3.1 Training Course: the course of the training of air-borne dust survey incharge should cover, among others, the following major subjects or areas:

- Detailed procedure for conducting air-borne dust survey in mines covering location and duration of sampling, types of sampling and instruments/accessories used for survey.
- Details about checking and operation of the instruments.
- Method of determination of air borne dust concentration including method of weighing filter papers, collection of dust.
- 'Permissible limit' and other statutory provisions regarding airborne dust survey in mines.
- Various dust control measures.

3.4 The Airborne dust survey In-charge shall be assisted by adequate number of trained dust survey assistants.

4.0 Sampling Procedure

4.1 Places to be sampled:

4.1.1 General : All the workplaces in a mine, where respirable dust is evolved, shall be sampled to ascertain the air borne dust concentration of that area and the dust exposure profile for different categories of work persons working in that area. In view of the above, Manager of every mine shall identify such places in the mine. Mine air of that area shall be sampled by 'static sampling' method by a fixed type sampling instrument. Measuring the dust exposure of selected workers, whose exposure is deemed to be representative of their groups, by 'portal to portal personal monitoring' by using personal dust samplers shall also be done .

4.1.2 Fixed point or static sampling for underground workings **The following places shall be sampled by fixed type samplers or static samplers.**

For Bord & Pillar Workings

i. Within 30m outbye of the first working face in the intake side of the district.
ii. 30m outbye of the last working facein the return side of the district.
iii. Working faces
iv. Loading/Unloading/Transfer points
v. Bunkers/Chutes

For Longwall Workings

i. 30 m outbye of the face in the intake airway
ii. 10 m from the intake end at the face
iii. 10 m inbye from the return end of the face
iv. at the centre of the face
v. 30 m outbye of the face in the return airway.
vi. Loading/Unloading/Transfer points
vii. Bunkers/Chutes

For Mechanised Longwall gate roads

i. 10m outbye of the face
ii. 30m outbye of the face
iii. Loading/Unloading/Transfer points
iv. Bunkers/Chutes

Personal Dust Sampling for underground workings

Dust exposure of the following categories of persons shall be determined by personal dust sampler:

- Loaders
- Shotfireres and helpers
- Drillers/ Dressers
- Operators and helpers of loading machines(SDL, LHD, Shuttle cars, gathering arm loaders or other mechanical loaders)
- Operators of Cutter loaders (shearer, plough, continuous miner, road headers etc)
- Longwall face crews
- Conveyors, bunkers or chute operators

- Overman or other competent person

4.1.4 Fixed point or static sampling for opencast workings and other surface operations : For fixed-point or static sampling in opencast workings or other surface operations, direction of air current should be kept in mind and the Instrument should be placed on the return side of the point of dust generation. It is suggested that more than one fixed-point sampler shall be installed along the circumference of concentric circles of 5m & 10m radius around the point of equipment generating dust. The samplers shall be installed along the direction of wind or air current and the samplers may change their location during sampling with change of direction of air current.

5m
10m

Personal Dust Sampling for Opencast Workings and other surface operations

Dust exposure of the following categories of persons shall be determined by personal dust sampler:

- Drillers and helpers
- Operators of excavators/loaders (Shovel, Back hoe, Dragline, Front end loaders)
- Dumpers & Tipper operators & helpers
- Dozer/Grader operators & helpers
- CHP crews, crusher operators & helpers, wagon loaders
- Overman or other competent person.
- Any other machine operators

4.2 Position of samplers (Static): Sampling should be carried out with air inlet of the Instrument facing the air current keeping the instrument in horizontal position, if the velocity of air is less than 4 metre per second and perpendicular to the air current, if the velocity of air is more than 4 meter per second. The instrument shall be placed at about breathing level with normal posture of the operator and located centrally, and away from the side, as far as practicable. Safety of the instrument and interference of the normal work shall be kept in mind for positioning the instrument.

< 4m/s
> 4m/s

4.3 Frequency of dust sampling: (a) Every place as mentioned above shall be sampled by static samplers or personal samplers, at-least once in every one month. 1m

(b) Such measurement shall also be carried out immediately upon the commissioning of any plant, equipment or machinery or upon the introduction of any new work practice or upon any alteration therein that is likely to bring about any substantial change in the levels of airborne respirable dust.

Rejection of samples ✓

A sample shall be rejected in the following cases:

- If the instrument was not working throughout the entire shift of 8 hours ✓
- If duration of operation in that area , including operation of machine is less than 80% of normal duration of operation in a shift.

- In case of 'portal to portal' sampling, if the person to whom the personal dust sampler is attached does not do his normal work in that shift.

3Y **Preservation of filter papers** The filter papers sued for a particular sampling shall be preserved properly alongwith its serial number and date of sampling. These filter papers shall be preserved at least for a period of three (03) years and shall be readily available to the Inspector of Mines if so desired.

7.0 Report on Air Borne Dust Survey After conducting the air borne dust survey as per the above guidelines a report shall be prepared giving the following details:

(i) Introduction

(ii) Methodology of dust sampling:

(a) Sampling strategy for static sampling

(b) Sampling strategy for personal sampling

(c) Instrumentation

(iii) Observation: (a) Tables showing the results of air borne dust survey for static and personal sampling. (b) Maximum dust concentration and time weighted Average (TWA) for different locations and operation.

(iv) Conclusion

(v) Recommendations

1 m. As required under Reg 143 (3) (a) of CMR 2017 the owner, agent or manager of every mine once at least in every month thereafter or whenever theRegional Inspector so requires by an order in writing, cause the air at every work place mentioned above shall be sampled by fixed point samplers..

50/ 75%. 3m. 1m. Provided that, if any measurement at any workplace shows the concentration in excess of fifty percentor seventy five percent of the permissible limitthe subsequent measurementsshall be carried on at intervals not exceeding three months or one month respectively :

Provided further that, such measurements shall also be carried on immediately upon the commissioning of any plant, equipment or machinery or upon the introduction of any new work practice or upon any alteration therein that is likely to bring about any substantial change in the level of airborne respirable dust.

1m (b) The samples drawn shall as far as practicable, be representative of the levels of dustexposure of work-persons. For this purpose, the sampler shall be positioned on the returnside of the point of dust generation and within 1 metre of the normal working position of butnot behind the operator or other worker whose exposure is deemed to be maximum in hisworking group. 1m

(4) When the dust monitoring results have established that the permissible limit of dustconcentrations being exceeded at any place, immediate steps shall be taken to minimize theemission of dust and to notify the Regional

Inspector. If however, the average concentrationof respirable dust in a series of 5 samples taken in 7 successive normal working shifts during the subsequent month exceeds one and half times the "permissible limits" the relevant operation oroperations causing excessive dust shall cease. The operation or operations shall not beresumed and allowed to be carried on until improvements have been made in the preventionand suppression of dust and fresh sampling carried out immediately on resumption of the saidoperation or operations has established that such improvements have reduced the dustconcentration below the "permissible limit". 5 7 1½

FMC Exam

At what all places in longwall working dust sampler shall be kept?

a) 30 m from the intake end,10m outbye of the face
b) 10 m from the intake end, 10m outbye of the face
c) 30 m from the intake end, 30m outbye of the face
d) 10 m from the intake end, 30m outbye of the face Ans:- (d)

(6)To prevent the liberation and accumulation of dust and the propagation of airborne dust,the following provisions shall have effect namely :

(a) dust shall be suppressed as close as possible to its source of formation;

(b) during any operation of drilling or boring on surface or belowground -

(i) the production of dust shall be reduced by using bits which are sharp and ofproper shape, by keeping suitable pressure on the bits and by keeping the holes clear of the cuttings;

(ii) except in naturally wet ground, a jet water shall be directed on to the cutting edgeto wet the cuttings.

(c) every roadways on surface or below ground where mobile mining machinery ply, shall beregularly wetted or shall be effectively treated with some other equally efficient agent toreduce dust being raised in the atmosphere to a minimum.

(d) no plant for the screening or sorting of coal and as far as practicable, no heap of cinder,cement, sand, mortar or other dry and fine material shall be placed within 80 m. of the top ofany down-cast shaft or other intake airway nor shall any such material be so handled as tomake it air-borne an drawn into such shaft or airway. 80m

(e) In every working belowground –

(i) no machinery or equipment which is likely to emit dust in excess of'permissible limit' shall be operated unless it is equipped with a suitabledust-prevention and suppression device and unless such device isoperating efficiently ;

(ii) the design, arrangement, material and condition of picks on everymechanical coal cutter shall be such as to reduce the formation of dust tothe minimum and no mechanical coal cutter shall be operated unlesssuitable water sprays or jets of water are directed on the cutting edgesthereof so as to damp the cuttings as they are formed;

(iii) every working face and the floor, roof and sides of every roadway orairway within 50 metres thereof shall be, unless naturally wet throughout,regularly washed down to prevent accumulation of dust and shall be keptthoroughly wetted during the work shifts; 50m

(iv) a current of air sufficient to clear away the dust emitted by any machineryor operation and to dilute the dust concentration below the 'permissiblelimit', shall be maintained.

(v) after blasting, working places shall not be entered unless sufficient time has elapsed for dust, smoke and fumes to be cleared by a current of air

(g) the exhausted air, belowground, which contains dust in excess of the 'permissible limit'shall be efficiently diluted and if necessary filtered so as to reduce the concentration ofrespirable dust therein below ten percent of the 'permissible limit' before being re-circulatedinto working places. 10%

(h) every device used for the prevention and suppression of dust produced by any machinery,equipment or process as also for the filtering of the exhausted air and every dust respiratorshall be inspected once at least in every seven days and shall be thoroughly examined andtested at least once in every period of six months. 7D-7 6 mnth

144. Execution of measures for dust control – (1) (a) These shall be maintained at everymine having working belowground a dust plan on a scale having representative factor of notless than 2000:1. The dust plan shall clearly show (by distinctive colours, code letter and/ornumbers) the separate areas: -

(i) which are naturally wet;

(ii) which require treatment with water indicating the system of water pipe lines laid downfor the purpose; and

(iii) which require treatment with incombustible dust at such intervals of 24 hours, 7 days,14 days, 30 days three months or other specified period as the case may be (Theintervals aforesaid shall be based on the results of analysis of routine mine dustsamples collected from the areas concerned).

(1A)(a) Every part of a mine which is not naturally wet throughout or which is not isolated byexplosion-proof stoppings shall be treated –

(i) with fine incombustible dust in such manner and at such intervals as will ensure that the dust on the floor, roof and sides and any support or structure shall always consist of a mixture containing **not less than that 75% of incombustible matter in case of coal seams containing less than 30% volatile**matter (on dry ash free basis) and 85% **of incombustible matter in case ofcoal seams containing more than 30% of such volatile matter;** or

(ii) With water in such manner and at such intervals as will ensure that the dust

on the floor, roof and sides and or any support or structure is always combined with not less than 30% by weight of water in intimate mixture.

(b) Properties of incombustible dust used for the above purpose:

(i) it shall not contain more than 5% of free silica;

(ii) of such fineness and character, that it shall readily dispersible into the air and it shall not cake but it is dispersed into the air

(iii) as far as practicable light in colour.

FMC Exam 2015

What shall not be the properties of incombustible matter?

a) Light in color

b) Easily dispersible in air

c) Shall cake

d) Shall not contain more than 5% silica   Ans:- (c)

(c) No such incombustible dust shall continue to be used if it is found by tests which shall becarried out once at least in every three months, not to comply with the foregoingrequirements:

(d) where any place or part of the mine is to be treated with incombustible dust :

(i) before treating with incombustible dust, all coal dust shall be cleaned, as faras practicable, from the roof, sides, floor, props, cogs, bars, brattice cloth orany other objects or structure or place on which coal dust may deposit, and all dust so collected shall be removed to the surface within 24 hours.

(iii) the cleaning of coal dust and spreading of incombustible dust shall be carriedout in the direction of the flow of the air;

(3) The dust control measures aforesaid shall be carried out under he supervision of acompetent persons holding a **manager's or overman's certificate or a degree or diploma in mining or mining engineering** from a university or institution approve by the CentralGovernment for the purpose of proviso to Regulation 16(1). No duties with respect ofsampling of dust under Regulation 123B shall be entrusted to this person who may bedesignated as the "Dust Incharge" nor any other duties shall be entrusted to such personexcept with the previous permission of the Regional Inspector:

Provided that in the case of a mine having an average monthly output of less than **5000 tonnes**, the Dust Incharge referred to in this regulation can act as the Sampling Inchargereferred to in regulation 123B.

(4) The Dust Incharge shall see :

(a) that every part of the mine which, under these regulations, requires treatment with water,is thoroughly drenched or sprayed with water immediately before firing shots and also atintervals during the working hours so as to strictly comply with the provisions of regulation123(5)(b)(ii);

(b) that every part of the mine which, under these regulations can be treated with incombustible dust, is so treated as to strictly comply with the provisions of regulation123(5)(b)(i); and

(c) that the arrangements for treating with water or incombustible dust as aforesaid aremaintained in good order.

145. Check on measures for dust control – (1) For the purpose of ensuring adequatetreatment of coal dust systematic samples ofmine dust shall be collected, tested and analysed at intervals and in the manner specified inthis regulation.

(2)(a) Every return airway as lies within two hundred m of the last working face andevery haulage tramming or conveyor roadway which is not naturally wet throughout, shall bedivided into-ones not longer than one hundred and fifty m each: Provided that where in a mine some parts are being treated with water and others withincombustible dust the zones shall be so formed that in each zone only one system of treatingcoal dust is being followed.

(b) Every zone formed as aforesaid shall be divided into three equal sections, each notexceeding 50 m in length.

(3)(a) Every zone shall be given a distinct number and every section the code letters a, b or cin a systematic manner. The zones and sections, with their numbers and code-letters, shallbe clearly marked on a plan prepared on a scale having a representative factor of not lessthan 2000:1 hereinafter called the "sampling plan". The sampling plan shall clearly show theareas of the mine that are naturally wet throughout.

(4)(a) Representative samples of dust shall be collected once in every 30 days from everyzone, and for this purpose samples may be collected from different sections a, b or c inrotation such that, during every such period of 30 days, all samples are collected from thesection a or section b or section c.

(b) Representative samples aforesaid shall be collected in a systematic manner irrespectiveof the cleaning and treating operations but shall in no case be collected within 20 hours ofcleaning and treating of any zone, section or part thereof.

(5) In every travelling roadway, and in every airway other than those specified in subregulation(2)(a) samples shall be taken in such a systematic manner and at such intervals(not exceeding three months) that a proper check is maintained on the efficiency of thetreatment thereof in terms of regulation 123A(1A)(a).

(6)(a) Samples of dust shall be collected from roof, sides, and floor, and shall comprise ofdust collected to a depth not exceeding five millimeters on the roof and sides, and to a depthnot exceeding 10 millimeters on the floor.

(b) Where a zone is treated with incombustible dust, the samples shall be collected by amethod of 'strip' sampling, the strips being as near as possible of equal width of not less than10 cm, and a uniform intervals not exceeding five meter.

(c) Where a zone is treated with water the samples shall be collected by a method of "spot"sampling such that a spot-collection of dust is made for every metre of the length sampled, asnearly as possible at regularly spaced intervals along a zigzag path.

(e) Each sample shall be well-mixed and then reduced in bulk (by quartering) to a weight ofnot less than 30 gm. Each sample so reduced shall be packed in a moisture-proofcontainer which shall be suitably labelled or marked.

(7) The sampling operations aforesaid shall be carried out under the supervision of a competent person holding a manager's or overman's certificate or degree or diploma inmining or mining engineering from a university or institution approved for the purpose ofregulation 16. He shall be designated as the "Sampling Incharge" and shall be different fromDust Incharge appointed under regulation 123A. No other duties shall be entrusted to thisperson except with the previous permission of the Regional Inspector.

(8) Sample shall be analyzed within seven days of taking sample.

Naturally wet throughout - A place in a mine is considered "Naturally wet throughout" if it is moist enough to keep the coal dust present, at any time, on the roof, sides and floor and other objects at that place so that it is always combined with not less than 30 percent by weight of – was in intimate mixture.

146. Stone dust barriers – (1) In every gassy seam of the second or third degree [or in thedevelopment working in a gassy seam of the first degree in which there is likelihood ofoccurrence of inflammable gas in dangerous quantities], additional precautions shall be takenby providing stone dust barriers to **prevent an ignition or explosion from extending from one part of the mine to the other.**

(2) Every such stone dust barrier shall be approved by the ChiefInspector.

(3) If any dispute arises as to whether stone dust barrier are required to in any part of a gassy seam of the first degree , shall be referred to CI for final decision.

Type of stone dust barrier to be provided in a belowground coal mine
G.S.R. 979(E) 01/10/2018

1. GENERAL: 1.1 Stone dust barriers shall be placed in the full path of the explosion and the shelves shall be so arranged that their collapse in the event of an explosion is not impeded. 1.2 Barriers shall be sited as low as

convenient within the upper third of the roadway; and no part of any shelf and no stone dust on it shall be less than 10cms. from the roof or sides of the roadway or any roadway support. In addition, the shelves shall be constructed and installed that, in the event of an explosion, they fly without obstruction along the roadway. 2. DESIGN OF BARRIERS:

2.1 The stone dust shall rest on boards which run longitudinally in the roadway and whose length equals the width of the shelves. These boards shall rest on a rigid frame, the two members of which shall be atleast 15 cms. in depth and rest on their edge on two fixed rigid brackets.

2.2 Neither the boards nor the frame shall be fastened either to each other or to the fixed brackets.

2.3 Primary or first or light barriers which are intended to be installed nearest to be a possible point of ignition, when installed, shall consist of lightly loaded shelves (see below) not more than 35 cms. in width.

2.4 The distance between two shelves of a light barrier shall be not less than 0.9 m. and not more than 2.0 m.

2.5 The shelves of a light barrier shall be loaded with not more than 30 kg. of dust per metre of shelf length and the total quantity of stone dust in the barrier shall be less than 110 kg. of stone dust per sq. metre cross-section.

2.6 Secondary or heavy type of barriers intended for use further outbye shall consist of one third of its shelves lightly loaded and spaced as in case of primary barriers.

2.7 The loading for a heavy barrier shall be 390 kg. per sq. metre of the cross-section. The shelves shall not exceed 50 cms. in width and their loading shall not exceed 60 kg. per metre of shelf length.

2.8 The distance between heavily loaded shelves or between a heavily loaded shelf and a lightly loaded shelf shall not be less than 125 cms. and not more than 270 cms.

2.9 The lightly loaded shelves shall be adjacent to each other and placed at the in bye end of the barrier.

2.10 Where circumstances require intermediate barriers, such barriers shall be loaded with 195 kg. of dust per square metre of roadway, half the dust being placed on lightly loaded shelves and half of heavily loaded shelves. The lightly loaded shelves being arranged at the inbye end, as in the case of heavy barriers.

2.11 When calculating the quantity of stone dust in a barrier, cross sectional area shall mean the average cross sectional area determined by an offset survey of the roadway where the barrier is installed. The amount of stone dust in the lightly loaded shelves in a heavy barrier

shall be calculated proportionately on the basis of average length of the shelf as determined from the offset survey plan.

2.12 For maximum dispersability the dust shall be piled loose on the shelves. The dust shall also be of a type that will not cake in use; in damp or wet condition water-proofed stone dust shall be used.

2.13 Where a roadway has to be enlarged to provide sufficient height to accommodate a barrier, the ripping shall extend over a distance on each side of the barrier equal to at least 20 times thedifference between the height of the top of the stone dust on the barrier and the height of the unripped roadway.

2.14 When sitting a barrier, the distance as specified shall be measured from the shelf nearest to the face.

3. BOARD AND PILLAR WORKINGS:

3.1 The workings in the mine shall be divided into sections so that an explosion occurring in one section may not spread to another. The barriers may be sited in relation to group of adjacent headings.

3.2 In board and pillar working, only a heavy type barrier may be provided at a suitable site in relation to the groups of headings in a district intended to be served by the barrier. Such a barrier shall be provided at a distance of not less than 135 metres from the nearest working face and not more than 365 metres from the farthest face.

3.3 Heavy barriers shall be provided in all the entries to the district. When in any entry a stopping is to be provided instead of a dust barrier, such stopping shall be explosion proof. If any dispute arises whether a stopping is explosion proof, it shall be referred to the Chief Inspector for decision so, however, that such stopping shall be of strong construction with brick in cement and not less than 1.8 metres in thickness and located at a position corresponding the inbyeend of the barriers. The gallery outbye of such stoppings shall be kept cleared of coal dust heavily stone-dusted and adequately ventilated.

3.4 The barrier including the explosion proof stoppings, if any, shall be provided at fresh sites as the faces advance, in order to comply with the conditions mentioned under para 3.2 above.

3.5 The sites of stone dust barriers shall be predetermined at the time of planning the mine and the pillars at such sites shall be of adequate size so that the shelves of the barriers are included in about one pillar length. Where the shelves of a stone dust barrier extend through a junction of galleries, either the cross galleries shall be blocked off by stopping and such galleries kept adequately treated with stone dust and ventilated, or the shelves extended into the cross galleries for a length on either side which is not less than the length of barrier extending over the junction and outbye of it.

3.6 Where it is impracticable to site a barrier within the upper limit of 365 metres, the matter may be referred to the Chief Inspector.

3.7 When a new district is being developed, a barrier or barriers shall be sited in the adjacent transport road within the distance mentioned under para 3.2 to give protection in relation to the group of newly started headings.

4.0 SINGLE HEADINGS IN COAL:

4.1 When a single heading is driven from an existing main roadway, a barrier of heavy type shall be sited in the main road at a distance specified under para 3.2 measured from the face of the heading.

5.0 LONGWALL WORKINGS:

5.1 A barrier of light type shall be installed in all longwall gate conveyor roads within the range of 45-110 metres from the nearest point of the face.

5.2 A second barrier of heavy type shall be installed in longwall gate conveyor roads at a distance of 180-320 metres from the face.

5.3 When a conveyor gate is being developed and the road is too short to accommodate barriers, a light and a heavy barrier shall be sited on the trunk conveyor road outbye of the transfer point at the respective distances mentioned under para 5.1 and 5.2.

5.4 Where the trunk conveyor road passes inbye of the transfer point to other districts, two more such barriers shall be provided in the corresponding positions, inbye of the transfer point.

5.5 For a newly developed face which does not have a separate ventilating split, a pair of barriers shall be sited on the trunk road at the distances specified above.

5.6 Where a number of longwall faces are being developed from a relatively short length of trunk road, protection shall be provided to prevent an explosion occurring at any face from spreading to other parts of the mine and also as far as practicable, so as to prevent an explosion from spreading to an adjacent face. Where practicable, this protection shall be provided by a system of light and heavy barriers.

6.0 SHAFT INSETS:

6.1 Where more than one seams are worked from the same shafts, heavy type of barriers shall be sited in the roads adjacent to the shaft landings in each seam at a distance of 90 m. to 150 m. from the landing. These barriers shall, as far as possible, be so arranged that they are in the middle of a straight stretch, at least 180 m. in length. 7.0 BARRIERS IN THIN SEAM: 7.1 In thin seam where the roof condition does not allow heightening of

roadways to accommodate barrier shelves in the manner specified under paragraph 1.1 and 1.2, stone dust barriers may be provided in the following manner:-

(a) In the travelling roads and airways other than haulage roads, the stone dust barrier shelves may be provided of shorter length, leaving a clear space of at least 10 cms. on one side, and up to 90 cms. on the other side for passage of men, provided that the length of the shelves shall not be less than 180 cms. suitable type of fencing shall be provided between the travelling passage and the part of the roadway containing barrier shelves.

(b) In the haulage and tramming roads, the stone dust barrier shelves may be provided on either side of the track leaving a clear space of at least 10 cms. from the side of a tub and a shelf. Provided that the length of the shelf shall not be less than 90 cms. and where the roadway cannot be safely widened to accommodate such shelves, the shelves may be located on the side of the track.

(c) The total quantity of stone dust in the stone dust barrier shall be at least 1-1/2 times of that required in normal cases, the rate of loading of shelves remaining the same.

(d) The part of the roadway containing the stone dust barriers shall be kept clean of coal dust and adequately treated with stone dust on roof, floor, and sides including cogs and other supports.

8.0 MAINTENANCE:

8.1 For proper discharge of his statutory duties, the Ventilation Officer shall ensure proper construction and maintenance of the barriers in the following manner :-

(a) He shall examine the stone dust barriers once at least in every week. As a part of this examination, dispersability of the dust shall be tested by taking some dust in hand and blowing on it. If this shows that the dust has tended to cake or consolidate, the dust in the barrier shall be removed and replaced by fresh dust.

(b) He shall arrange for repair of any damage to the shelves or other parts of the barrier.

(c) He shall supervise the erection of new barriers as required.

(d) He shall write a report on such inspection and on any action taken or required. The report shall be countersigned by the manager. In the book maintained for such reports, there shall also be recorded all data concerning position, quantity of stone dust, cross section of the road in which the dust barrier is situated, date of inspection and renewal of stone dust and any other relevant particulars.

(e) If at any time, the Ventilation Officer is not in a position to rectify any defect, or damage to a barrier, he shall report the matter to the manager who shall take immediate action to put the barrier in proper order.

8.2 If any defect in the stone dust barrier is not possible to be removed forthwith, shotfiring shall be stopped in the district or districts concerned, pending remedy of the defect as early as possible.

8.3 The barriers, as required, shall be moved at necessary intervals to ensure that they are maintained constantly within the recommended range of distance from the face.

9.0 CHECK BOARDS :

9.1 A board shall be provided near each barrier on which the following information shall be recorded.

(a) Cross-section of the roadway.
(b) Total dust loading on the barrier.
(c) Number and loading of shelves.
(d) Date of last removal of stone dust.
(e) Reference number of the barrier.
(f) Date of last inspection by the Ventilation Officer.
(g) Signature of the Ventilation Officer.

9.2 The following particulars in respect of stone dust barrier shall be shown on the rescue and stone dusting plans :-

(a) Position, type of barriers, and date of their construction.

(b) Projection for next position of the barriers, and the likely date of their installation. These Plans shall be brought up-to-date not less than once in three months and copies of the stone dusting plan shall be provided to the officials and competent persons responsible for examining and maintaining the barriers.

Pneumoconiosis

Excessive or long term exposure to harmful respirable dusts may result in a respiratory disease called pneumoconiosis. It is a general name for a number of dust-related lung diseases including the following:

- Silicosis-silicosis is a disease caused due to breathing of dust containing silica particles.There is no cure for this disease , thus prevention is the only answer.
- Coal Worker's Pneumoconiosis (CWP) : Coal Worker's Pneumoconiosis (CWP), also called Black Lung Disease , is a form of pneumoconiosis in which respirable coal dust particles accumulate in the lungs and darken the tissue. This disease is progressive.
- Asbestosis : Asbestosis is a form of pneumoconiosis caused by asbestos fibres. This disease is also irreversible.

Defining the Dust

Dust is generally understood to be an aerosol of solid particles of size 0.1μm and above.

(a) **Inhalable dust** : It is the fraction of airborne dust that enters the nose and mouth during breathing , and is therefore available for deposition in the respiratory tract.

(b) **Respirable Dust** : It is the fraction of inhalable dust that penetrates into the gas exchange region of the lung. It is mostly in the size fraction of 0.1 to 10 μm.

(Cir. Tech 1/2010)

Precautions against danger of coal explosion while extracting pillars by opencast method

- Where the UG workings are accessible, the same shall be surveyed and cleaned of coal dust and thickly stonedusted before commencement of extraction of pillars.
- All persons shall be withdrawn from UG , in the same working seam or any other seam or section connected before blasting.
- Spacing of holes in last OB bench shall be so adjusted that blast holes do not directly fire in to the UG workings.
- The depth of hole in the last OB bench shall be such as to leave atleast 3m thickness of OB above the coal seam.
- Where there are cracks and cervices, the bottom 2m length of the hole shall be filled with sand.
- No delay detonators to be used in coal unless otherwise permitted by DGMS as conditions may be imposed.
- Where more than one section of the seam had been developed on pillars, the shotholes shall not be drilled to within 3m of a lower section, and care shall be taken that, as far as possible, the blastholes do not directly fire into any underground gallery.
- All holes in the last OB bench and/or coal shall be charged with water ampoules or with moist sand of atleast 0.6m in length at the bottom of the hole.
- No person including shotfirer shall take shelter within 100m of the quarry openings.
- The opencast workings and underground set of workings shall be under the administrative and technical direction and control of the same manager and/or agent.

(Cir. Tech 3/1980)

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In Bord & Pillar working stone dust barrier shall be provided at a distance of not less than _____ from the nearest working face and not more than _____from the farthest face.

a) 135 m, 135 m
b) 60 m, 120
c) 135m ,365 m
d) 60 m , 75 m

Ans:- c) 135m, 365m

In Bord and Pillar working quantity of stone dust in the barrier shall be not less than ____and in heavy type barrier not less than_____of stone dust per sq. metre cross-section.

a) 60kg, 110kg
b) 110kg, 390 kg

c) 110 kg, 390 kg
d) 60 kg, 390 kg

Ans:- (b) 110kg, 390 kg

147. Precautions against irruption of gas –Where any working isextended to **within 30 metersof any goaf or disused workings** containing or likely to containan accumulation of inflammable or noxious gases, there shall be maintained **at leastone bore-hole not less than 1.5 meters in advance of the working.**

148. Recovery and exploratory work –(1) After an explosion of inflammable gas or coal dusthas occurred in a mine, only such persons as are authorise by the manager or by theprincipal official present at the surface, shall be allowed to enter the mine.
(2)When it is intended of proposed to reopen a mine or part thereof, which has been isolated,sealed off or flooded with water to deal with a fire or spontaneous heating, the owner, agentor manager shall, not less than thirty days before the commencement of such work, give noticein writing of such intention or proposal to the Regional Inspector and the Chief Inspector.
(3) Where it is intended to carry out any exploratory work in a mine or part belowground likelyto contain irrespirable atmosphere –
(a) all work shall be done under rescue cover only;
(b)no party of less than three persons shall be allowed to proceed to carry out such work; and
(b) every such party shall carry a flame safety lamp and instrument for detecting carbon monoxide gas approved by the Chief Inspector.

149. Danger from surface water –(2)Everyentrance into a mine shall be so designed, constructed, and maintained that its lowest point(which means the point at which a body of rising water on surface can enter the mine) shallbe not less than 1.5 meters above the highest flood level at that point.
(5)In every mine which is likely to be endangered by surface water, the highest flood levels and dangerlevels at least 1.2 meters or as required by the Regional Inspector, below the highest flood level, shall bepermanently marked at appropriate places on the surface and whenever water rises towards the danger levelat any place, all persons shall be withdrawn from the mine sufficiently in advance .
(6) No workings shall be made in any mine vertically below –
(a) any part of any river, canal, lake, tank or other surface reservoir; or
(b) any spot lying within a horizontal distance of 15 m from either bank of a river orcanal or from the boundary of a lake, tank or other surface reservoir;
except with the permission in writing of the Chief Inspector and subject to such conditions as he may specify therein.

(7) Every application for permission under sub-regulation (2) shall be accompanied by twocopies of a plan and section showing the existing position of the workings of the mine, theproposed layout of workings, the depth of the surface, the position and depth of any goaves inevery seam in the neighborhood, all faults, dikes and other geological disturbances and suchother particulars as may affect the safety of the mine or of the persons employed therein.

Explanation– Where sand or alluvium are lying in the course of a river, canal, lake, tank or reservoir, the depth from the surface shall be reckoned from the surface of hard ground underlying such sand or alluvium.

(9) A competent person shall, once at least in every 14 days during the rainy season andonce at least in every 30 days during other periods of the year, examine every protectivemeasure taken to prevent any danger of inrush of surface water into the mine or part.
10) The protective measure shall also be inspected by manager personally once at least inevery quarter.

150. Danger from underground inundation-(1) Proper provision shall be made in everymine to prevent irruption of water other liquid matter or any material that is likely to flow whenwet from the workings of the mine the same mine or of an adjoining mine and to preventaccidents while drilling bore-holes for probe or release of a body of water or other liquidmatter.
(2) Where work is being done in –
(a)(i) Where work is being done in –
(ii) any place in a seam or section, which is at a lower level that any other place in a lowerseam or section; or
(iii) any place in a seam approaching a fault passing through an upper seam or section, whichcontains or may contain an accumulation of water or other liquid matter or any material that islikely to flow when wet; or
(3)Without prejudice to the requirement of sub-regulation (1) and sub regulation (2),noworking which has approached within a distance of 60 m of any other working containing water shall be extended further except with the prior permissionin writing of the Regional Inspector.
(4)(a)Every application for permission to extend any working referred to in sub-regulation (3)shall be accompanied by two copies of the plan and section showing:
(i) The outlines of all such disused or abandoned workings in relation to the working approaching them and also the depth of such disused or abandoned workings from the surface;
(ii) The outlines, the lay out and the method of the proposed workings for which permission is sought;
(iii) The faults, dykes and other geological disturbances in relation to working specified inclause (i) or (ii) of the sub-regulation; and

(iv)Any other information that is available with the management and any other particularsor information that may be required by the Chief Inspector.

(5) Whenever seepage of water, which is not normal to the seam is noticed at any placeworkings or if there be any such suspicion or doubt such working shall immediately bestopped and the Chief Inspector and the Regional Inspector shall forthwith be informed ofsuch seepage. Such working shall not be extended further except with the prior permission inwriting of the Chief Inspector and subject to such conditions as he may specify therein.

(6)(a) The height or width of any working referred to in sub-regulation (3) shall not exceed 2.4 m and there shall be maintained at least one bore-hole near the centre of the working face, and sufficient flank bore-holes on each side; and, where necessary, bore-holes above and below the working to intervals of not more than 5m.All such bore-holes shall be drilled sufficient close to each other to ensure that theadvancing face will not accidentally hole through into a working containing water or liquidmatter or any material that is likely to flow when wet and shall be] maintained and shall beconstantly maintained at sufficient distance in advance of the working and such distance shallin no case be less than 3m.

> In case of plans, whose accuracy is not fully established . no working shall be advanced towards any water logged working even if these are shown on the plans to be at a distance of more than 60m, unless a 30m thickness of the barrier is physically proved by bore holes.

151. Intentional flooding - (1) When the owner, agent or manager intends or proposed, byintroducing water from the surface or from any other part of the mine or from an adjacentmine, to flood any part of the workings of his mine, he shall give, in writing, **not less than 14 days' notice** of such intention or proposal to the Chief Inspector and the Regional Inspectorand to the management of all adjoining mines and of such other mines as might be affectedby such flooding.

Provided that the Regional Inspector may, be an order in writing and subject to suchconditions as he may specify therein, permit such operations to be commenced on any dayprior to the expiry of the said 14 days.

(2) If the operations in respect of which notice is given under sub-regulation (1), are notcommenced within 60 days from the expiry of the said 14 days, the notice shall be deemed tohave lapsed and the provision of the sub-regulation(1) shall apply as if no such notice hadbeen given.

152. Construction of reservoir, water dam, etc. – (1) Where in any mine, it is intended to construct areservoir, dam or other structure to withstand a pressure of water or other material which willflow when wet, or to control an inrush of water, the owner, agent or manager shall give inwriting not less than 14 days notice of such

intention to the Regional Inspector. Every suchnotice shall be accompanied by two copies of plans and sections showing the design and other details of the proposed construction.

Thickness of Water Dam , T $= \dfrac{HW^{3/2}}{8S}$

Where H = head of water (m)

W= width or height of gallery(m) (whichever is greater)

S = Crushing strength of material (kg/cm^2)

MULTIPLE CHOICE QUESTIONS

Precautions Against Dangers From Fire, Dust , Gas & Water

1. Rate of emission of inflammable gas in cubic meter per tonne of coal raised shall be examined once at least in ________
   - a) 30 days
   - b) Everyday
   - c) 7 days
   - d) 14 days
2. General body of air means the general atmosphere in ______?
   - a) Roof cavities
   - b) Borehole
   - c) Disused gallery
   - d) Sealed off area
3. Air samples taken for analyzing inflammable gas shall be analyzed within_____
   - a) 7 days
   - b) 24 hours
   - c) 3 days
   - d) 4 days
4. As a precautionary measures against surface fire , all surface structures & supports within horizontal distance of ____________ from all entrance to mine shall be of fire proof material.
   - a) 15 m
   - b) 30 m
   - c) 10 m
   - d) 45 m
5. In case of first degree gassy seam, electric welding may be used belowground, by the written permission of ________
   - a) Safety officer
   - b) Ventilation officer
   - c) RI
   - d) Manager
6. As a precautionary measures against spontaneous heating test for % of CO shall be done once at least in every ____________
   - a) 30 days
   - b) 7 days
   - c) 14 days
   - d) 15 days
7. Grahm's ratio shall be analysed once at least in every ______.

   - a) 30 days
   - b) 7 days
   - c) 14 days
   - d) 15 days
8. All unused working which have not been sealed off shall be inspected once at least in every __________ for any fire risk.
   - a) idle day
   - b) 15 days
   - c) 7 days
   - d) 14 days
9. What should be the minimum operating life of CH_4 (electro chemical) sensor of telemonitoring system ?
   - a) 1 year
   - b) 2year
   - c) 3year
   - d) 5year
10. What is the working limit temperature for operating telemonitoring system ?
    - a) 30°C
    - b) 33.5°C
    - c) 50°C
    - d) 100°C
11. OEM shall examine the telemonitoring system totally at least once in every _____.
    - a) One month
    - b) 3 months
    - c) 6 months
    - d) 12 months
12. What shall be the minimum intensity of the audio part of AVA of telemonitoring system ?
    - a) 85 dB(A)
    - b) 90dB(A)
    - c) 110dB(A)
    - d) 115dB(A)
13. Firefighting equipments shall be examined by a competent person once at least in every ________
    - a) One month
    - b) 3 months
    - c) 6 months
    - d) 12 months
14. Calibration of methanometer shall be carried out every __________
    - a) One month

b) 3 months
c) 6 months
d) 12 months

15. What should be the limiting value of dust when the % of free silica is 6 ?
a) 3 mg/m^3 6|10|1.66 6|15|2.5
b) 2.5 mg/m^3
c) 0.4mg/m^3
d) 2mg/m^3

16. What should be the concentration of dust for the place to be harmless when % of free silica is 3 ?
a) 5 mg/m^3
b) 0.2mg/m^3
c) 3mg/m^3 ✓
d) 2mg/m^3 (Not) CMR

17. Airborne dust survey shall be conducted once at least in every ________
a) One month
b) 3 months
c) 6 months -
d) 12 months

18. Filter paper used for air borne dust survey sampling shall be preserved at least for a period of ________
a) 6 months
b) 12 months
c) 3 months
d) 3 year ✓

19. A borehole of not less than 1.5 m in advance of the working shall be maintained when working is extended to within ___30m.___ of any disused working.
a) 60 m
b) 75 m CMR 147
c) 30 m ✓
d) 120 m

20. Manager shall give notice to CI & RI about intentional flooding , not less than ________ of such intention.
a) 15 days
b) 14 days ✓
c) 60 days
d) 30 days

Answers

1.a 2.a 3.d 4.c 5.d 6.b 7.a 8.c 9.b 10.c 11.c 12.b 13.a
14.b 15.b 16.c 17.c 18.d 19.d 20.b

Ventilation

153. Standard of ventilation. –(2) For the purpose of securing adequate ventilation the owner, agent and manager shall ensure that :

(i) in every ventilating district, not less than **six cubic meter per minute of air per person** employed in the district on the largest shift or **not less than 2.5 cubic m per** minute of air per daily tonne output whichever is larger, passes along the last ventilation connection in the district which means the inbye-most gallery in the district along which the air passes;

(ii) at every place in the mine where persons are required to work or pass, **the air does not contain less than 19% of oxygen or more than 0.5%of carbon dioxide** or any noxious gas in quantity likely to affect the health of any person;

(iii) the percentage of inflammable gas does **not exceed 0.75** in the general body of the return air of any ventilating district and **1.25** in any place in the mine;

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What is the permissible quantity of inflammable gas in general body of air and return air ?

a. 1.25, 0.75
b. 0.75, 1.25
c. 0.5, 0.75
d. 0.5, 0.5
e. 1.25, 1.25

Ans : (b) 0.75, 1.25

(iv) the wet bulb temperature in any working place does **not exceed 33.5°C**; and where the wet bulb temperature exceeds **30.5 °C** arrangements are made to ventilate the same with a current of **air moving at a speed of not less than 1m/sec.**

(v) air samples and temperature readings shall be taken at least once in 30days.

At all sinking shafts deeper than 30m there should be some mechanical means of ventilation.

(DGMS Instruction 20/11/2007)

Notice has to be sent forthwith to RI if percentage of inflammable gas in any return airway exceeds 0.75.

(Cir. 5/1966)

Ventilating District *means such part of a mine below ground as has an independentintake airway commencing from a main intake airway, and an independent return airwayterminating at a main return airway, and, in the case of a mine or part thereof which isventilated by natural means, the whole mine or part.*

154. Main Mechanical Ventilator, its drive and fittings – (1) Every main mechanical ventilator in a mine shall be capable of producing adequate ventilation in the mine or part andshall be **installed on the surface at a distance of not less than 10 m from the opening of the shaft** or incline at any point.

[Reason: To prevent fan from explosion in case of fire in mine & to avoid recirculation]

(2)If electricity is used for driving themechanical ventilator electrical energy shall be supplied to the drive motor of the ventilatorthrough a separate circuit from the main distribution point of the mine.

(3)In every belowground working, two different sources of power to the mechanical ventilator shall beprovided.

(4) Every main mechanical ventilator shall be so designed installed and maintained that thecurrent of air can be reversed when necessary.

(5) At every shaft or incline ordinarily used for lowering or raising of persons or materialswhere a mechanical ventilator is installed there shall be provided a properly constructed air lock.

The suitable air-lock designs are –

I. Standard type of air lock at the top of shaft enclosing part of the tip.
II. Guillotine type of doors which are provided in a vertical steel box fitted within the headgear.
III. German type box which forms an air lock inside the shaft.

(Cir. 82/1966)

155. Restriction of installation of mechanical ventilator belowground in fiery and certain gassy seams. – In every fiery seam or gassy seam of the second or third degree the following provisions shall have effect in relation to the installation belowground of booster fans.

(1)No booster fan shall be installed belowground in the mine unless the manager is satisfied, as a result of a survey of the ventilation of every party of the mine liable to be affected, that such installation is necessary or expedient for the proper ventilation of the mine and that it should be installed. **Seven days' prior notice** of every such installation, together with particulars of the survey aforesaid, shall be sent to the Regional Inspector.

Explanation – The shifting of a booster fan from one place to another shall be deemed to be an installation of a booster fan for the purpose of this regulation.

Booster fan means a mechanical ventilator used belowground for boosting the whole current of air passing along the intake or return airway of a mine or ventilating district.

156. Installation and maintenance of mechanical ventilators –(1) In every belowground coal mine where a booster or auxiliary fan is electrically driven, the

drive motor, unless it is so constructed, installed, operated and maintained as to prevent the risk of open sparking, shall not be placed in a return airway.

(2) The installation and maintenance of every mechanical ventilator and booster fan shallbe supervised and controlled by a competent person appointed for the purpose; and except inan emergency, no person shall start, stop, remove or in any way alter, repair or interfere withany such ventilator and fan except by or on the authority of the manager or other officialauthorised in this behalf.

(3) A competent person appointed for the purpose shall, once at least in every seven days,examine every mechanical ventilator and booster fan in use.

(8)(a) In every mine in which a mechanical ventilator is in use, the quantity of air shall, once atleast **in every 14 days** be measured –

(i) in every main intake and return airway of every seam or section, as near as practicable to the entrance to the mine;

(ii) in every split, as near as practicable to the point at which the split commences;

(iii) in every ventilating district, as near as practicable to the point where the air is subdivided at the end of a split and also where it enters the first working place; and

(iv) any other point the Regional Inspector may, by an order in writing, specify.

Provided that in a non-fiery seam or a gassy seam of the first degree it shall be sufficient totake the air measurement once in every 30 days.

157. Standing Orders. –(1) The manager of every mine in which a mechanical ventilator other than an auxiliary fan is installed shall submit, within a period of thirty days of the installation to the Regional Inspector, standing orders specifying the action that shall be taken with respect to the withdrawal of persons from the mine or part thereof in the event of a stoppage of the ventilator.

Auxiliary fan means a forcing fan or an exhausting fan used belowground wholly or mainly for ventilating one or more faces forming part of a ventilating district.

Model Standing Orders In The Event Of Stoppage Of the Main Mechanical Ventilator

- Fan attendant shall not stop the main mechanical ventilator except on written authority of manager or a person authorized by him in this behalf.
- Electric current shall be cut off from all apparatus belowground excluding auxiliary fans (if installed belowground), except from such apparatus as is situated in a main intake airway or at a distance greater than 270m from nearest working place.
- Withdraw all persons present belowground from the working place to the nearest main intake airway atleast 270m away from the nearest working face, to the downcast shaft bottom, or in case this is worked wholly or partly by incline, to the surface.
- If the ventilator is restarted within a period of one hour, all working places shall be examined by an overman or competent person and if they are found to be free from inflammable and noxious gases and in safe condition, persons may be allowed to proceed to their respective working area.
- If the ventilator has not been restarted within a period of one hour from time of its stoppage, all person shall be withdrawn from the working belowground.

- *When the ventilator has been restarted after a period of more than one hour from the time of its stoppage, all working places in the mine shall be examined by an overman or competent person.*

(Cir. 53/1973)

158. Splits and airways –(1) For the purpose of ventilation, every mine shall be divided intosuch number of districts or splits as to ensure that separate current of fresh air is made available in every such district or split.

(2) The intake air shall be so arranged as to travel away from all stagnant water.

(3) In every ventilating district there shall be provided two main intake airways one of which shall be used as atravelling roadway.

Extra Shots

Reason for two main intake airways:

i. For more circulation of air in the district.
ii. To provide escape route in case of any eventuality like major roof fall, fire etc happens in other.

Reason For them to be independent

i. To prevent short circuiting and in turn disruption of ventilation of the district.
ii. To prevent the accumulation of inflammable/noxious gases to explosive/permissible limit.

(Cir. Tech 04/2014)

(4) Every connection between a main intake airway and a main return airway shall until it has ceased to be required and has been sealed off, be provided with at least two doors so spaced that whenever one door is opened, the other door can be kept closed. Steps shall be taken to ensure that at least once of the door is always closed.

159. Brattices, doors, stoppings ad air-crossings. - (2) (a) The space between the frame or every ventilation door and the roof and sides of the roadway, shall be built up with masonry or concrete, not less than 25 cm in thickness.

(3)(a) Every stopping between the main intake and main return airways shall be constructedof masonry or brickwork, or of concrete without reinforcement, not less than 25 centimeters in thickness, and if constructed of properly reinforced concrete, not less than 15 centimeterin thickness or such greater thicknessas may be required by the Regional Inspector, and shall be faced with a sufficient thickness oflime or cement plaster to prevent leakage of air.

The minimum thickness of a ventilation stopping should in no case be less than 38 cm.

(Cir 17/1964)

Extra Shots- Cross sectional area of airway shall not be less than 9.3m^2.

(8) In case of a mine having problems of fires or spontaneous heating along with the working of coal seams of degree two or degree three gassiness, the Chief Inspector may by an order in writing and subject to such conditions as he may specify therein, require construction of explosion proof ventilation stoppings between the main intake and the main return airways and at such other places as may be specified by him.

(10) The partitions and walls of every air-crossing shall be not less than 25 cm inthickness if constructed or masonry or of concrete not properly reinforced, and not less than15 centimeters in thickness if constructed of properly reinforced concrete.
(12) A competent person shall, once atleast in every 14 days, examine every airway, aircrossing, ventilation stopping and door in use.

160. Velocity of Air Current – The velocity of air current measured in (m/min) atthe place shown in column (2) shall be not less than that shown in column (3) for the differentseams shown in column (1) of the Table given below :

Degree of gassiness	Place where velocity of air is to be measured	Velocity of air
First, Second or Third degree	Immediate outbye ventilation connection from theface.	30
First or Second degree	(i) 4.5 m from any face whether working or discontinued on the intake side of the brattice or partition;	30
	(ii) 7.5 m outbye of the discharge end of an air pipe;	15
	(iii) at the maximum span of along wall face.	60
Third degree	(i) 4.5 m from any face whether working or discontinued on the intake side of the brattice or partition;	45
	(ii) 7.5 m outbye of the discharge end of an air pipe;	25
	(iii) at the maximum span of along wall face.	75

Maximum air velocity

LOCATION	Maximum air Velocity(m/s)
Ventilation shaft not provided with winding equipment, fan drifts.	15
Ventilation shafts where man-winding is not carried out , or hoisting shafts only	12
Shafts used for man-winding or man-hoisting shafts and haulage, roads other than conveyor roads)	8
Other roadways	6
Conveyor roads, loading points and transfer points	4
Working faces in developing or depillaring/stopping areas including longwall faces	4

(Cir. 42/1974)

FMC Exam'14
What shall be the minimum velocity of air 4.5 m from a face in intake side of brattice in second degree mine?

- a. 45 m/min
- b. 60 m/min
- c. 75 m/min
- d. 25 m/min
- e. 30 m/min

Ans : (e) 30m/min

161. Auxiliary fans- (1) Every auxiliary fan :(a) shall be installed, located and worked in such a manner that –
(i) a sufficient quantity of air shall, at all times, reach it so as to ensure that it does not re-circulate air; and
(ii) there is no risk of the air which it circulates being contaminated by any substantial quantity of inflammable or noxious gases or dust; and
(b) shall, whether driven electrically or otherwise, be efficiently connected with earthso as to avoid the accumulation of an electrostatic charge; and
(c) shall have an air-duct for conducting the air to or from the face or blind end; and such air-duct shall be so maintained as to minimize any leakage or air and to ensure an adequate supply of air to within 3m of the face or blind end.
(2) No auxiliary fan shall be started, stopped, removed, replace or in any way altered orinterfered with, except by or on the authority of an official.
(4)In every belowground working, conditions for installation of two or more auxiliary fans in the sameventilating district or split shall be specified by the Chief Inspector in a general order.

Conditions for Installation of two or more auxiliary fans In the same ventilating district or split

G.S.R. 979(E) 01/10/2018

1.0 Selection of type and capacity of auxiliary fans and their location of installation shall be based on the scientific study.

2.0 Installation of auxiliary fans shall comply with all the relevant provisions under the Coal Mines Regulations and the Central Electricity Authority Regulations, 2010 as applicable to such installation,
particularly that of Regulation 161 of the Coal Mines Regulations, 2017 and regulation-110 of CEAR, 2010. 3.0 (a) Before any auxiliary fan is installed and also, at least once every week thereafter, the quantity of air flowing in the airway at the point of its installation shall be measured by the Ventilation Officer. The fan shall not be installed or continued to be operated unless the measurement shows that sufficient quantity of air is available so however that

(i) not more than 50% of total air passing in the roadway is taken by the auxiliary fan; and

(ii) ventilation of the inbye faces, when the fans are running, is adequate.

(b) Particulars of the quantities measured as at Clause 2.0(a) shall be duly recorded in a bound paged book kept for the purpose.

(c) There shall be also kept at the mine an accurate plan showing the general system of ventilation in the district and the quantity of air current therein.

4.0 (a) The auxiliary fans shall be installed, as forcing fan, on the intake side of the place to be ventilated by it.

(b) No auxiliary fan shall be installed at a point within or less than 4.5m from the nearer side of the entrance to the place to be ventilated by it.

5.0 (a) Air entering any of the auxiliary fans in the district shall not contain:

(i) more than 0.3% CH4; and

(ii) excessive quantity of dust.

(b) The percentage of CH4 in the return air in any heading ventilated by an auxiliary fan shall not exceed 0.5%.

(c) The auxiliary fans in the district shall be electrically interlocked by a sequence control which ensures that unless the first fan is running the second fan cannot be started and so on.

6.0 (a) No person shall start an auxiliary fan on any occasion unless the overman or a competent person authorized in this behalf considers that it is safe for the fan to be so started.

(b) An auxiliary fan on the return side shall not be started or re-started after stoppage of the auxiliary fan on its intake side due to power failure or otherwise, unless an overman or a competent person specially authorized by the Manager for the purpose.

7.0 (a) No workman shall enter or be allowed to enter in any heading ventilated by an auxiliary fan unless the overman or competent person has inspected the place and fount it safe and the requirements at Clause 4.0 above are also satisfied.

(b) In case of any interruption in the ventilation arrangements for working places, all persons shall be withdrawn from the area affected, with the exception of those required to rectify the situation.

(c) Particulars of every stoppage of auxiliary fan(s) and their re-starting shall be recorded by the overman or competent persons in a bound paged book kept for the purpose.

8.0 (a) No person other than an official of the mine, Ventilation Officer or a person authorized by the Manager for do so, shall regulate the quantity of air passing through or delivered by an auxiliary fan.

(b) If it is necessary to regulate an auxiliary fan, it shall be done in such a way as to prevent authorized or inadvertent alteration.

(c) Fans delivering air to flexible ducting shall not be regulated by constricting the ducting.

(d) Fans with rigid ducting shall not be regulated by placing loosed obstruction such as brick or stone in the ducting.

9.0 (a) The supply of electricity to the working place shall only be effected when the auxiliary fans are running satisfactorily and;

(b) On restarting the fan after a prolonged shutdown, sufficient time shall be allowed to elapse to clear any accumulation of gas or foul air before re-establishing the supply of electricity to the working place.

162. Precautions against fire in ventilation appliances.- (1) Every mechanical ventilator on the surface shall be installed in a suitable fire proof housing.

(2) In the case of every fan other than an auxiliary fan installed belowground, the coal or other carbonaceous material exposed in the sides, roof and floor shall be covered with masonry or other fire resistant sealant as protection against fire, for a distance of not less than 5 meters in every direction from the fan.

(3) The covering of every shaft sealed off or covered for ventilation purposes, every fan drift, duct or casing and every part of a mechanical ventilator or fan within such drift, duct or casing, and every air- crossing and ventilation door shall be constructed of fire-proof material: Provided that this regulation shall not apply to the small lid of a shaft-covering operated by the rope cappel.

163. Ventilation plants to be brought up-to-date. – The manager shall ensure that, as soonas any alteration is made in the ventilation of a mine involving the erection or removal of anair-crossing or stopping or the alteration in the position of or installation of a ventilator or fan(other than an auxiliary fan) below ground, the erection, removal, alteration or installation, asthe case may be, is notified to the surveyor who shall forthwith make necessary alterations onthe ventilation plan.

(Cir. 84/1966)

165. Precautions against gas during de-watering and re-opening.- (1) No disused mine orshaft shall be de-watered except under the constant supervision of a competent personand during such de-watering, approved safety lamps or torches shall be exclusively used,and there shall also be kept burning at every place where persons are at work at least oneapproved flame safety lamp.

(2) (a) The first inspection of a mine or part which is re-opened after a discontinuance of mining operations for a period exceeding seven days and of any part of amine after being dewateredshall be made by a competent person with an approved flame safety lamp and duringsuch inspection, no additional light or lamp other than an approved electric torch or lamp shallbe used.

Provision of Barometer

In order to find out if there is any abnormal change in the barometric change in the barometric pressure which would affect the rete of emission of noxious gases underground from sealed off areas etc. It is advisable that each mine should provide a barometer.

(Cir. 84/1966)

166. Precautions against inflammable and noxious gases – (1)For the purpose of this regulation,inflammable gas shall be deemed to have been found or detected when it is indicated–

(i)by a methane detector to be 0.1 per cent. or more in case of mine having degree one gassy seams;

(ii)by a methane detector to be 0.5 per cent. or more in case of mine having degree two seams;

(iii)by the lowered flame of a flame safety lamp or, where methane detectors are used, theyindicate one and a quarter per cent. or more of inflammable gas in case of mine having degreethree gassy seams.

(4) During the removal of such gas all persons except those necessary for such removal, shallbe withdrawn from the return side of the ventilating district in which the gas has been detectedunless the quantity of gas is, in the opinion of the competent persons, so small that suchwithdrawal is not necessary :

Provided that where the danger arises from the presence of inflammable gas, no naked lightshall be used in the ventilating district in which the gas is detected.

(5) No person shall be re-admitted into the place where the gas was detected until a competent person has examined the place and has reported that the place is free from gas,Every such examination shall be made with an approved flame safety lamp and, in the caseof noxious gas, means of detecting carbonmonoxide gas approved by the Chief Inspector.

(6) Particulars of every occurrence referred to in sub-regulation (2) and of every examinationmade under sub-regulation(5) together with a statement as to where and when the gas wasfound and when it was removed, and in case of inflammable gas, the percentage thereof,shall be recorded in a bound paged book kept for the purpose, Every such entry shall besigned and dated by the competent person making the report, and countersigned and datedby the manager.

167. Inspection of unused workings for gas – In any fiery seam or gassy seam of the secondor third degree or where the Regional Inspector may require by an order in writing, all unusedworkings which have not been sealed off, shall, once at least in every seven days, beinspected by a competent person for the presence of inflammable or noxious gas.

169. Determination of percentage of inflammable gas and of environmental conditions –(1) Where electric energy is used in any ventilating district in a gassy seam of the second or third degree, determination shall be made of the percentage of inflammable gas present in the general body of air; and the following provisions shall apply in respect of such determinations, namely:

(a) the determination shall be made by a competent person either by means of an apparatus of a type approved for the purpose by the Chief Inspector, or by analysis of samples of air.

Provided that if determinations are made by the analysis of air, the samples shall be analysed within three days of the taking thereof.

(c) The determinations shall be made or samples of air taken, as the case may be, once at least in every seven days, so however that –

(i) if any determination shows the percentage of inflammable gas to exceed **0.8**, determinations shall be made or samples of air taken,at intervals not exceeding twenty-four hours for so long as such content exceeds that percentage and for the seven next following days, unless theRegional Inspector otherwise permits by an order in writing and subject tosuch conditions as he may specify therein at intervals **not exceeding 24 hours** for so long as such content exceeds that percentage and for theseven next following days; and

(ii) if the determinations made during the 30 days immediately preceding any day have shown the percentage of inflammable gas to be below 0.6, itshall be sufficient to make such determinations of take such samples,once in every 30 days for so long as such content does not exceed that percentage.

Provided that when any alteration is made in the system of ventilation so as to substantially affect or likely to affect the ventilation of the mine, such determination shall be made within 24 hours of such alteration.

(e) If any determination in any ventilating district shows the percentage of inflammable gas to exceed once and a quarter, the supply of electric energy shallbe cut off immediately from all cables and apparatus in the district, and a writtenreport thereof submitted to the Regional Inspector forthwith.

(2) If the Regional Inspector so requires by an order in writing in respect of any mine havingworkings belowground, determinations shall, once at least in every 30 days, be made oftemperature, humidity and such other environmental conditions at such points as theRegional Inspector may specify in the order.

Samples of coal dust collected for analyzing the percentage of incombustible matter shall be analyzed within 10 days & mine air samples shall be analyzed within 4 days.

(Cir.87/1966)

171. General precautions in gassy mines – In every mine the following provisions shallhave effect, namely-

(1) No working or gallery shall be extended to a distance of more than 3m from thenearest ventilation connection unless the current of air is coursed upto a point within 3 m of the face by means of fire resistant pipes, tubes, brattices or other material.

(2) No narrow 'main' or advance gallery shall be driven more than three m ahead of thewidened gallery.

(3) Every stopping between the main intake and the main return airways shall be substantiallybuilt and every air-crossing shall be constructed and maintained as to withstand the force ofan explosion.

(4) The main air current shall be so split and coursed that an air current which ventilates agoaved out area, whether packed or unpacked, or any disused working shall not, except withthe prior permission in writing of the Regional Inspector and subject to such conditions as hemay specify therein, ventilate any workings where coal is being extracted.

(5) No major alteration shall be made in the system of ventilation except with the priorpermission in writingof the **Regional Inspector** and subject to such conditions as he mayspecify therein.

173. Underground relighting stations –'RELIGHTING STATION', shall be situated in every belowground mine in a main intake airway,and shall be placed in charge of a competent person.

Use and care of Local Methane Detectors in Underground Coal Mines

Local Methane Detectors (LMD) are being installed in underground coal mines for monitoring the make of inflammable gases and for imitating suitable mitigating measures well in advance before the concentration assumed dangerous proportions.

1.0 Various components which make an LMD :- An LMD shall include the following as essential basic components.

- A CH4 sensor unit
- An FLP housing for the electrical circuits and a display unit for the detected and measured CH4 concentration. The FLP housing may be integrated with the sensor unit. The FLP housing shall be of an approved type. The FLP housing shall accommodate various arrangements for battery backup and coupling the LMD with the power supply system of the ventilating district.
- An audio-visual warning alarm unit.

2.0 The defined parameters of the life of the sensor used in the LMDs and their operating limits in terms of temperature and relative humidity :- The minimum life of a sensor used in the LMDs shall be at **least three years**. The sensor shall operate satisfactorily at a temperature upto 50^0 C and a relative humidity of upto 100%.

3.0 Place of installation of the LMD :- The LMD shall be installed in the main district ventilation **return airway** of the district, as close as practically possible to a well-supported roof as may facilitate clear observation of the display unit.

4.0 The type of electrical interlinking necessary with the LMD :- Every LMD shall have a provision of a suitable outlet for coupling with the electrical supply system of the ventilating district by way of approved cables, connectors and other electrical accessories. The tripping circuit of the LMD shall be electrically interlocked with the power supply system of the connected workings so as to cut off power supply when the concentration of the measured inflammables gases exceeds a preset value.

5.0 The minimum required power back up with the LMD :- The minimum required power backup in the event of disruption of the main electrical power supply shall be for a period of 60 minutes, to be provided by a battery preferably of a rechargeable type and with a minimum life of 12 months from the date of dispatch of the battery. Wherever there is no battery backup, the same shall be incorporated within a period of six months.

6.0 The levels of Audio-visual alarm to be provided in terms of intensity :- The audio level of the audio-visual alarm shall be **at least 85 dB (A)**. The visual alarm shall be consisting of a cluster of LEDs or other suitable arrangements as may be distinctly visible from at least two opposite directions.

7.0 The frequency of calibration of sensors and other components :- The maximum interval of calibration of the sensors **shall not exceed three months**, alternating between the OEM and the user. All calibrations shall be done by the OEM.

8.0 The type of back-up service required for proper up keep of the system viz-a-viz reliability :- The OEM examine the LMD in totally at least once every six months.

(Cir. Tech 14/2009)

MULTIPLE CHOICE QUESTIONS

Ventilation

1. At a place in a mine where working is going on, the air shall not contain less than ______ of oxygen.
   - a) 19%
   - b) 21%
   - c) 20.93%
   - d) 17%
2. Mine air shall not contain more than __________ CO_2.
   - a) 1.25%
   - b) 0.75%
   - c) 0.5%
   - d) 0.05%
3. At a place where wet bulb temperature exceeds 30.5°C, arrangement shall be made to ventilate that place with current of air moving at a speed not less than __________.
   - a) 12 m/s
   - b) 1 m/s
   - c) 3m/s
   - d) 4m/s
4. According to DGMS circular notice has to be sent to RI immediately when % of inflammable gas exceeds __________.
   - a) 1.25
   - b) 0.5
   - c) 5.4
   - d) 0.75
5. Minimum distance of main mechanical ventilator from the opening of the shaft shall be __________.
   - a) 13.5 m
   - b) 10 m
   - c) 15 m
   - d) 13 m
6. How many days before installation of booster fan notice is required to be sent to RI.
   - a) 14 days
   - b) 7days
   - c) 15days
   - d) 60days
7. Main mechanical ventilator & booster fan shall be examined by competent person once at least in __________
   - a) 14 days
   - b) 7days
   - c) 15days
   - d) 60days
8. Standing order in the event of stoppage of Main mechanical ventilator is to be prepared by
   - a) Ventilation officer
   - b) Manager
   - c) Safety officer
   - d) Assistant manager
9. Standing order in the case of Main mechanical ventilator specify the action to be taken in the event of __________
   - a) Fire in fan
   - b) Explosion in fan
   - c) Stoppage of the ventilator
   - d) Accident due to fan
10. According to DGMS circular minimum thickness of a ventilation stopping should be __________.
    - a) 25 cm
    - b) 28 cm
    - c) 38 cm
    - d) 1 m
11. What shall be the minimum velocity of air at the maximum span of longwall face in third degree gassy mines?
    - a) 60 m /min
    - b) 75m /min
    - c) 46m /min
    - d) 30m /min
12. What shall be the maximum velocity of air in the ventilation shaft where man winding in not carried out ?
    - a) 15 m/s
    - b) 4m/s
    - c) 10m/s
    - d) 12m/s
13. What shall be the minimum life of sensor used on local methane detector ?
    - a) 1 year
    - b) 2 year

c) 3 year
d) 5 year

14. OEM shall examine local methane detector in totally at least once in every ___?
a) 1 month
b) 3 month
c) 12 months
d) 6 months

15. Intensity of audio of AVA of local methane detector shall be at least ___?
a) 85 dB(A)
b) 90dB(A)
c) 95dB(A)
d) 115dB(A)

Answers

1.a 2.c 3.b 4.d 5.b 6.b 7.b 8.b 9.c 10.c 11.b 11.b 12.d 13.c 14.d 15.a

Lighting and Safety Lamps

174. Whitewashing – The roof and sides of the following places belowground in a mine shallbe kept effectively whitewashed –

(a) every shaft inset and shaft bottom or siding and every byepass which is in regularuse;

(b) the top and bottom of every haulage plane, every regular stopping place, siding, landing, byepass, and junction, except within 100 m of the face;

(c) every travelling roadway;

(d) every room and place containing any engine, motor or other apparatus; and

(e) every first aid station belowground.

175. General lighting .- (1) Adequate general lighting arrangements shall be provided duringworking hours –

(a) on the surface where the natural light is insufficient : in every engine house, in thevicinity of every working shaft, at every open cast working, at every shunting ormarshaling yard, and at very place where persons have to work; and

(b) belowground –

(i) at every shaft landing and shaft bottom or siding which is in regular use;

(ii) in every travelling roadway normally used by 50 or more persons during anyshift:

(iii) at the top and bottom of every self-acting incline in regular use;

(iv) at every place on a haulage roadway, at which tubs are regularly coupled oruncoupled or attached to or detached from a haulage rope;

(v) at every place at which tubs are regularly filled mechanically;

(vi) at every room and place containing any engine, motor or other apparatus;

(vii) at every place where any pillar is under extraction; and

(viii) at every first aid station below ground.

(6)Fluorescent or luminescent path finder or indicator shall be provided all along the travelling roadwayand in the escape route in the mine.

176. Electric lighting in gassy mines – (1) Subject to the provisions of Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010 relating to the use of electric energy in parts of mines in which inflammable gas

is likelyto occur in quantity sufficient to be indicative of danger, electric lighting from a source ofsupply external to the lighting unit may be used –

(a) on any roadway or place ventilated by intake air; and

(b) on any other roadway or place not within 270 m of the nearest face.

178. Standards of lighting. –

Flood lights in depillaring area

1st degree – 4 or more 250 watts bulb or equivalent lighting where the workingheight exceeds 3m.

(Cir. 36/1969)

2nd or 3rd degree- Every depillaring area shall be provided with general lighting by cluster of not less than 15-20 cap safety lamps placed on a suitable stand in the area.

(Cir. 42/1961)

Standards of Illumination in opencast coal mines

G.S.R. 979(E) 01/10/2018

Abbreviations- V: Vertical; H:

Serial No.	Place/Area to be illuminated	Minimum standards of illumination to be provided (in lux)
1	Work place of Heavy Machinery	15H, 25 V (so as to cover depth and height through which the machine operates.)
2	Drilling operations	
	(i)Area where drilling rig works	25 V (so as to illuminate full height of the drilling rig)
	(ii)Area where drill holes exists	15 H
3	Places where manual work is done	15 H, 25 V
4	Places where loading, unloading or transfer, loading of dumpers, trucks or train is carried on (including OB Dump and Coal Stack Yard)	15 H, 15 V
5	Operators cabins of machines or mechanisms	50 H at all places of operation
6	Haul roads for Trucks and Dumpers	10 H
7	Rail haulage track in the pit	10 H
8	Roadways and footpaths from bench to bench	10 H
9	Permanent paths for use of persons employed etc.	10 H
10	In-pit Crusher/Feeder Breaker	40 H
11	Hand Picking Points	50 H
12	Conveyers	
	(a) Transfer points and drive/tail end area	40 H
	(b) Along conveyor	20 H
13	Coal Handling Plant	
	(a) Places of crushing, screening, segregation and loading/unloading	40 H
	(b) Operation points	50 H

	(c) Other places (in general)	20 H
14	Pumping Station	40 H
15	(i) Electrical Sub-station	100 H, 50 V
	(ii) Other places of operation of electrical apparatus/equipment	20 H, 20 V
16	First Aid station	50 H
17	Rest shelter	30 H
18	Workshop	100 H, 50 V
19	Parking Yard	50 H
20	General working areas as determined by the Manager in writing	10 H at the level of surface to be illuminated

Guidelines for mine illumination

For better implementation of standards of lighting, the manager of every mine shall formulate a detailed written "Illumination Scheme", which may include an "Illumination Plan" and duties and responsibilities of Key officials for the purpose.

Illumination Survey:

(i) The manager of every mine shall arrange to conduct Lighting Survey once at least in every month to ensure adequacy of illumination.

(ii) While making such survey, the measurement of lighting shall also be taken at the point farthest from the source of light lying within the limit of the work place or in haul road or travelling or haulage roadway, as the case may be.

(iii) A record of every such survey shall be maintained and signed by the competent person making the survey and countersigned and dated by the manager.

Illumination Plan:

(i) The manager of every mine shall ensure that an Illumination Plan, indicating the location of places, type of illuminating devices, fixtures, lamps, supports, any other devices for illumination and showing required as well as measured value of light at various places to be illuminated, is maintained. Where any area of the mine is not in use or not needed to be lighted, the same shall be clearly marked and demarcated on the plan with reasons to be recorded. The plan shall be kept signed and dated by the surveyor and the official authorized for maintaining the lighting standard and countersigned and dated by the manager.

(ii) The Illumination Plan shall be brought up to date in every month based on the monthly illumination survey and considering the current status of workings.

179. Maintenance and repairs of safety lamps -The manager, assistant manger, under ground manager or a competent person appointed for the purpose shall, once at least in every seven days, examine thoroughly every safety lamp in use.

[Extra shots : Fuse rating of cap lamp is 4A]

The fuse in an electric cap lamp is an important component on which the safety of a cap lamp largely depends. **Cap lamp being neither intrinsically safe nor flameproof (a lamp is usually safe because of the statistical improbability of ignition, due to the special care that is taken in its design and construction)**, it is the fuse which provides the only safety valve in the lamp. The fuse is intended for restricting the amount of current flow between the conductors of the cable cord, if short circuited just outside the battery container or the cord armour, to such a valve as will not produce sparks that will ignite an explosive mixture of methane and air.

(Cir. 71/1964)

A flame safety lamp is not safe in an atmosphere containing acetylene gas, so acetylene shall not be used in gas demonstration apparatus.

(Cir. 11/1967)

Life of flame safety lamps may vary from 5 to 6 years.

(Cir. Approval 2007)

ESSO Solvent BP 1425 or its equivalent or motor spirit shall be used as fuel in Velox GL & and GL 50 safety lamps for effective functioning of the flame safety lamps in mine.

(Cir Tech 5/2009)

MULTIPLE CHOICE QUESTIONS

Lighting & Safety Lamp

1. What should be the standard of lighting to be provided in dumper's haul road in opencast mine ?
   a) 5 lux
   b) 10 lux
   c) 30 lux
   d) 0.5-3 lux
2. What should be the standard of lighting to be provided in work place of heavy machinery in horizontal direction ?
   a) 15 lux
   b) 10 lux
   c) 30 lux
   d) 0.5-3 lux
3. What should be the standard of lighting to be provided at main junction in belowground mine?
   a) 0.4 lumen/sq.ft
   b) 1.25 lumen/sq.ft
   c) 30 lumen/sq.ft
   d) 1.5lumen/sq.ft
4. Every depillaring area of 1st degree gassy mines where working height exceeds 3 m shall be provided with general lighting by ____________.
   a) 4 or more 250 watt bulbs
   b) Six 100 watt bulb
   c) 15-20 cap safety lamp
   d) 20-25 cap safety lamp
5. Safety lamp to be examined once at least in __________.
   a) Every day
   b) 7 days
   c) After every shift
   d) 15 days
6. Electric safety lamp is ____________
   a) Flameproof
   b) Intrinsically safe
   c) Both
   d) None
7. Flame safety lamp shall not be used in atmosphere containing ________gas.
   a) Methane

   b) Carbon monoxide
   c) Carbon dioxide
   d) Acetylene
8. Generally life of flame safety lamp varies from ____________
   a) 1-2 year
   b) 5-6 year
   c) 3-4 year
   d) 10 year
9. Every depillaring area of 2nd and 3rd degree gassy mine shall be provided with general lighting by a cluster of ________
   a) 4 or more 250 watt bulbs
   b) Six 100 watt bulb
   c) 15-20 cap safety lamp
   d) 20-25 cap safety lamp

Answers

1.b 2.a 3.b 4.a 5.b 6.d 7.d 8.b 9.c

EXPLOSIVE AND SHOTFIRING

183. Type of Explosives to be used in mines.– (1) No explosive shall be used in a mineexcept that provided by the owner, agent or manager.

(2)No explosive, other than a fuse or a detonator shall be issued for use in a mine, or taken into orused in any part of a mine, unless it is in the form of a cartridge:

Provided that in case of opencast mine, site mixed slurry or emulsion explosives or ammonium nitrate fuel oil may be issued for use or taken into or used in non-cartridge form.

(3) Explosive cartridges shall be used in mine only in the form in which they are received

(4) No liquid oxygen explosives shall be used in any mine.

184. Storage of explosives. –(2) Explosives shall not be taken into or kept in any building except a magazine duly approvedby the Licencing Authority under the Indian Explosives Act, 1884(4 of 1884).

Provided that the Regional Inspector may, by an order in writing and subject to suchconditions as he may specify therein, permit the use of any store or premises speciallyconstructed at or near the entrance to a mine for the temporary storage of explosivesintended for use in the mine or of surplus explosives brought out of the mine at the end of ashift.

(3) Explosives shall not be stored below ground in amine except with the approval in writing ofthe Chief Inspector.

185. Magazines, stores and premises to store explosives. – (1) Every magazine, or store orpremises, where explosives are stored shall be in charge of a competent person who shall beresponsible for the proper receipt, storage and issue of explosives.

(3) Explosives shall be issued only to competent persons upon written requisition signed bythe blaster or by a official authorised for the purpose, and only against their signature orthumb impression.

186. Cases and containers for carrying explosives – (i)Cases or containers made of iron or steel shall be heavily galvanized ; and nocase or container provided for carrying detonators shall be constructed of metal or otherconductive material.

(2) No detonator shall be kept in a case of container which contains other explosives,materials or tools; and two or more types of detonators shall not be kept in the same case ofcontainer.

(4) no case or container shall contain **more than five kg of explosives**, and no person shall have in his possession at onetime in any place more than one such case or container :

Chief Inspector may, permit the carrying of a larger quantity of explosives in a singlecase or container, or the use, at one time in one place, of more than one such case orcontainer.

(6)The key of every case or container shall be retained by the blaster in his own possessionthroughout his shift.

All boxes used for carrying of explosive and detonators shall be colored different for different shifts.

First Shift : Red
Second Shift : Yellow
Third Shift : White

(Cir. 33/1964)

187. Transport of explosives. –(2) No person other than a shotfirer shall carry any priming cartridge into a shaft which is inthe course of being sunk.

188.Transport of explosives in bulk-

CONDITIONS FOR TRANSPORT OF EXPLOSIVES IN BULK
G.S.R. 979(E) 01/10/2018

1. The Owner, Agent or/and Manager of the mine where transportation of explosives in bulk is proposed to be practiced, shall ensure the following.
a) Only properly trained persons who are authorised in writing by the manager for the purpose are deployed.
b) Adequate personal protective equipments as required to be used by persons deployed in this connection are provided and also used.
2. The entire operations of transportation of explosives in bulk within an opencast mine shall be placed under the overall charge of a competent person holding atleast an Overman's certificate of competency.
3. Transport of explosives in bulk to the priming station or the site of blasting shall be done only during day light hours.
4. The quantity of explosives to be transported in bulk at one time to the site of blasting shall not exceed the actual quantity required for use in one round of shots, and also not before 30 minutes of the commencement of charging of holes. 5. Only a vehicle duly approved by the Competent Authority shall only be used for transport of explosives in bulk.
6. All conditions stipulated by the licensing authority in respect of the vehicle deployed for transportation and handling of explosives in bulk shall be strictly followed.

7. Such vehicle shall be in safe operating condition and should be driven by competent licensed drivers duly authorised by the Manager.

8. At least two fire extinguishers of suitable size and capable of fighting electrical and petroleum firesshall be provided in each vehicle in an easy accessible position and maintained in a state of readiness.

9. Additionally, the following precautions shall be strictly observed while transporting explosives in bulk.

(a) The vehicle shall be properly earthed with chain links while loading.

(b) The vehicle shall be well locked except during times of placement and removal of stocks of explosives.

(c) The vehicle shall not be overloaded.

(d) The vehicle shall not be driven at a speed exceeding 25 kilometers per hour. (e)
The vehicle loaded with explosives shall not be left un-attended.

(f) The vehicle shall be kept in isolated places while loaded.

(g) The vehicle loaded with explosives shall not be taken into garage or repair shop and shall not be parked in a congested place.

(h) The vehicle transporting explosives shall not be refuelled except in emergencies; even then it's engine shall be stopped and other precautions taken to prevent accidents.

(i) Wherever, drilling operations are being carried out, charging of already drilled deep holes shall not be carried out in the same area at the same time.

10. Every vehicle used for the transport of explosives in bulk shall be carefully inspected once in every 24 hours by a competent person, to ensure that:

(a) fire extinguishers are filled and are in place,

(b) the electric wiring is well insulated and firmly secured,

(c) the chassis, engine and body are clean and free from surplus oil and grease,

(d) the fuel tank and feed lines are not leaking and

(e) lights, brakes and steering mechanism are in good working order.

11. The mine manager shall frame a suitable code of practice for handling and transportation of explosives in bulk.

189. Reserve Stations. – In no case container containing explosives shall be left or kept belowground except in a place appointed by the manager or assistant manager or undergroundmanager for the purpose and so situated that it is not frequented by workpersons. Every suchplace shall be kept clean, safe and adequately fenced and legibly marked 'RESERVESTATION'.

> At reserve station explosive shall be kept only to be used during a shift and not for storing whole day.
>
> (Cir. Tech. 6/1980)

The conditions for site selection for establishing a Reserve Station:

G.S.R. 979(E) 01/10/2018

The Reserve station shall be selected in such a way as to ensure that:

(1) The place has no overhanging sides or prominent undercuts. The roof and sides are adequately supported and kept white-washed.

(2) The place is kept clean, is free from loose debris and is adequately fenced.

(3) The reserve station and all places lying within 18m of the same are cleaned of coal dust, and the roof, floor and sides in the area are adequately treated with incombustible dust. The floor of the workings in the 18m zone shall be particularly treated with at least 2cm thick layer of incombustible dust.

(4) No energized electric cables or any other source of energy having potential to ignite or explode explosives and/or initiation system, are allowed to pass within a distance of 90m from the reserve station.

(5) The place is adequately ventilated.

(6) The place is not frequented by persons.

190. Shotfirers. – (1) The preparation of charges and the charging and stemming of holes shallbe carried out by or under the personal supervision of a 'shot firer'. The shotfirer shall fire the shots himself.

(2) No person shall be appointed to be shotfirer unless he holds :

(a) a Manager's or Overman's Certificate or a Sirdar's Certificate together with aGas-testing Certificate in case of belowground mines

(b) a Manager's Overman's or Sirdar's Certificate or a Shot-firer's Certificate togetherwith a Gas-testing Certificate in the case of gassy seam of the first degree; and

(5) The manger shall fix, from time to time, the maximum number of shots that a shot-firermay fire in any one shiftand shall not in any case exceed :

(a) in the case of a gassy seam of the **second or third degree** or a **fiery seam, 40, if a single shot exploder** is used and **80, if a multy-shot exploder** is used;

(b) in the case of **other seams 50, in a single-shot exploder is used and 100, if a multi-shot exploder** is used; and

(c) in the case of **open cast mines 60,** if a single shot exploder is used or if blasting is done with ordinary detonators and **120, if a multi-shot exploder is used.**

SMC Exam'14

How many shots can shot firere may fire with single shot and multi shot exploder in case of degree II mine?

a. 40, 80
b. 50,100
c. 60,120
d. 50,50
e. 40,50

Ans: (a) 40,80

191. Shot-firing tools.– Every shot-firer on duty shall be provided with- (a) a suitable shot-firing apparatus;

(b) a suitable shot-firing cable;

(c) a suitable electric lamp or torch, a whistle and a stop watch;

(d) a tool, made entirely of wood, suitable for charging and stemming shot-holes;

(e) a scraper made of brass or wood suitable for cleaning out shot-holes;

(f) a pair of suitable crimpers for crimping detonators;

(g) where detonators are used, a pricker made of wood or of a non-ferrous metal for priming cartridges; (h) a suitable tool for detecting cracks;

(i) a methanometer for detection of inflammable gas in case of solid blasting;

(j) a circuit tester for checking shot-firing circuits.

(2) No tool or appliance other than that provided under sub-regulation (1) shall be used by a shot-firer.

Tools for detecting cracks in shotholes

The following specifications have been laid down for the tool to be used for detecting cracks in the shotholes:

1. General – A straight stiff rod or tube made of copper or wood with a flat prong at one end which forms an integral part of it.
2. Dimensions- Length of rod or tube : 6 inches longer than the depth of the shot hole but in no case more than 4'6"
3. Diameter of rod or tube- Half the diameter of the shot hole but in no case more than half an inch.
4. Length of prong- Not less than three quarter inch and not more than one inch from the centre of the rod or tube to the tip of the prong.
5. Width and thickness of prong at tip- not more than 3/32".

(Cir. 17/1958)

192. Drilling, charging, stemming and firing of shot-holes.– (1) No drill shall be used for drilling a shot-hole unless it allows a clearance of at least 0.3 centimeters over the diameter of the cartridge of explosives, which it is intended to use.

(2) No shot-hole shall be charged before it is thoroughly cleaned.

(3) Before any shot-hole is charged, the direction of the hole shall, where practicable, be distinctly marked on the roof or other convenient place.

(4) No detonator shall be inserted into a priming cartridge until immediately before it is to be used, however that in case of wet workings, priming cartridges may be prepared at the nearest convenient dry place and such primed cartridges shall be carried to the working place in a securely closed case or container.

(5) Detonators once inserted into a priming cartridge shall not be taken out.

(6) In belowground workings the explosive used in any shot-hole shall be of the same type.

(7) In opencast mines, to use two types of explosives in any shot-hole, the manager shall frame and enforce standing orders for the safe use of explosives and a copy of the same shall be submitted to the Regional Inspector. (8) The shot-firer shall, to the best of his judgment, ensure that no shot-hole is over-charged or under- charged, having regard to the task to be performed.

(9) Shots shall be fired electrically or by any other means or instruments or apparatus as approved by the Chief Inspector.

(10) Every shot-hole shall be stemmed with sufficient and suitable non-inflammable stemming so as to prevent the shot from blowing out.

(11) Only sand loosely filled in, or soft clay lightly pressed home, or a compact but not hard mixture of sand and clay or water shall be used as stemming and in no case, shall coal dust be used for the purpose of stemming.

(12) In charging or stemming a shot-hole, no metallic tool, scraper or rod shall be used and no explosive shall be forcibly pressed into a hole of insufficient size.

(13) No shot shall be fired except in a properly drilled, charged and stemmed shot-hole.

(14) All surplus explosives shall be removed from the vicinity of a shot hole before connecting the shot firing cable to the shot holes.

(15) As far as practicable, a shot shall be fired by the same shot-firer who charged it.

(16) No shot-hole shall be charged except those which are to be fired in that round and all shot-holes which have been charged shall be fired in one round.

(17) Where a large number of shots have to be fired, shot-firing shall, as far as practicable, be carried out between shifts.

(18) No person shall remove any stemming, or pull out any detonator lead, or remove any explosive from a shot-hole either before firing or after a misfire, or bore out a hole that has once been charged, or deepen or tamper with empty holes or sockets.

The stemming material should be compact but not hard. The use of mixture containing 70% fine sand, 30% clay and a small percentage of calcium chloride to keep it in a plastic condition is recommended.

(Cir. 49/1959)

Extra shots

Blown Out Shot- *A shot or blast is said to blowout when it come out of the blasthole and does not shatter the rock. Such shots dissipate the explosive force by blowing out the stemming instead of breaking down the coal.*

Blown out shots occur due to inadequate and improper stemming, excessive burden or spacing between shotholes, improper use of delay detonators and incorrect sequence of firing of shot holes.

Blown through shot- *It occurs from opposite side of blasting face and is due to insufficient parting between both side of face.*

It is required that at no stage should attempts be made to push any cartridge down when it gets stuck up because of insufficient diameter, obstruction in the shot-hole or any other reason. Such shot hole should be dealt with in the manner laid down in the regulations for misfired shots.

(Cir. Tech. 1/1975)

DGMS has specified that every shot to be fired in a shaft shall be fired electrically.

(Cir. Legis. 6 & 7/1991)

Misfire means the failure to explode of an entire charge of explosives in a shothole.

- *Sleeping of holes shall not be permitted in coal benches where fire or spontaneous heating has been detected and in overburden benches lying immediately above such seam and at all places where there is likelihood of fire or spontaneous heating.*
- *No PETN/NT bases cast booster shall be used for initiating non-cap sensitive slurry/emulsion explosive in coal benches and overburden benches of a fiery seam.*

(Cir. Tech. 4/2006)

Extra Shots

Sleeping Holes- Holes which are charged but not blasted on same day are called sleeping holes.

193. Use of ammonium nitrate fuel oil.–

CONDITIONS FOR USE OF AMMONIUM NITRATE FUEL OIL

G.S.R. 984(E).—1/10/18

Storage and Handling:

1. Ammonium nitrate should not be stored without obtaining licence from Chief Controller of explosives.

2. Storage&Transportation of Ammonium nitrate shall be done as per the provisions of Ammonium nitrate Rule 2012.

4. No person shall handle or caused to be handled the Ammonium nitrate in mine premises between the hours of sunset and sunrise.

5. No smoking, naked light or open flame should be allowed in the vicinity of ammonium nitrate at site.

6. Before being mixed on a blasting site, the ammonium nitrate should be stacked well clear of the diesel oil supply and there should be no fires within the working area.

7. As ammonium nitrate will pick up moisture from the atmosphere, care should be taken to prevent bags being torn. Under no circumstances should raked ammonium nitrate in bags or bulk be loosened by blasting.

8. Broken bags of ammonium nitrate should be cleaned up and properly disposed of immediately.

9. The unprocessed ammonium nitrate when transported in vehicle should be carried in a vehicle separate from explosives or combustible materials (including diesel oil).

10. Vehicles used for the transport of ammonium nitrate should be in a safe operating condition and should be driven by competent, licensed drivers.

11. Any tarpaulin or other material used to cover the load of ammonium nitrate should be fire-resistant.

12. (i) Semi-trailer or full trailer vans may be used for the on-site transportation of the ammonium nitrate fuel oil compositions, and for temporary storage of the same. Such vans should be kept in isolated locations while loaded.

(ii)The vans should be well ventilated and locked except during times of placement and removal of stocks of blasting agents.

(iii)No smoking and no open flames should be permitted in or near the vans containing blasting agents. (iv)The area surrounding the vans (when used as temporary storage), not less than 9 metres in all directions should be kept free of rubbish, dry grass or other materials of combustible nature.

(v)Not more than one day's production of field mixed ammonium nitrate should be temporarily stored in the vans at any one time.

Mixing etc.

13. The mixing or impregnating of ammonium nitrate, or a non-explosive mixture of ammonium nitrate (with other substances), with diesel oil should be carried out at or close to the shot holes before immediate use only.

14. No liquid hydrocarbon fuels with higher volatile than No.2 diesel fuel should be used. The most sensitive mixture of ammonium nitrate/diesel oil contains 2% oil, while a 5-6% mixture gives the maximum power. Percentage of oil in excess of 10 tends to lower sensitiveness. Excess oil should be avoided.

15.No person should smoke when mixing, carrying, handling or using the ANFO explosive or when near any person carrying on such work.

16. No person when mixing, charging or handling the explosive should allow any naked light or fire to be within 15 metres of the shot hole or the explosive.

17. The area surrounding the place of mixing for a distance of at least 15 metres should be kept free of rubbish, dry grass or other combustible materials.

18. All detonators, priming cartridge, and cordtex should be kept in secure receptacles at a safe distance from the explosives until actually required for use.

19. Not more than the quantity of mixture required for immediate use should be prepared. If for unforeseen circumstances explosive in excess of that required for immediate use is mixed, it should be packed in inner and outer packages and stored in a magazine duly approved by the Licencing Authority under the Indian Explosive Act. The inner packages must prevent the escape of the explosive or oil. A suitable

package is a thick polythene bag. The outer package can be of wood, soil fibre board or alluminium, but not of from or steel.

20. A suitable container in the form of portable wooden box should be used for pre-mixing near the shotholes to prevent accidental contamination by grit or other foreign matter as such a contamination may be dangerous. A suitable size for mixing upto 100 kg. At a time is 1.5 metres x 1.0 metre x 0.5 metre in depth. Shovels of similar material should only be used for the mixing, and no metallic shovel should be used. Preferably the mixing should be done by hand using rubber gloves. If necessary, a portable shelter may be used when mixing during inclement weather.

21. The mixing should not take place in the building where the bulk ammonium nitrate is stored.

22. When the mixture has been made, it should be kept in water proof bag until the time of use. The bags should be kept separately from all other materials, and no smoking, naked lights or open fires should be permitted within a distance of at least 15 metres there from.

23. When the mixing is done in a BULK MIXING DELIVERY SYSTEM, the following precautions shall be taken:

(i) Bulk Mixing and Delivery shall be done in a vehicle duly licensed by Chief Controller of Explosives.

(ii) The operations of mixing of AN and FO and its loading charging etc., shall be carried out under the guidance of the technical service engineer of the explosive manufacturer.

(iii) All conditions stipulated by the Chief Controller of Explosives for granting license for use of BMD vehicle shall be complied with.

(iv) The BMD vehicle shall be in a safe operating condition and shall be driven b a competent licensed driver.

(v) The vehicle shall be kept in an isolated location while loaded.

(vi) No smoking and no open flames shall be allowed within a radius of 60m of the vehicle.

(vii) The area surrounding the BMD vehicle, not less than 15m in all directions shall be kept free of rubbish, dry grass or other materials of combustible nature.

24. The prepared mixture should be carried only in wooden or similar containers, and not in a metallic container.

25. Discarded empty ammonium nitrate bags should be disposed of daily in a safe manner such as by burning in an isolated area, burying and so forth.

26. Only the necessary minimum number of persons should be allowed to be present at or within 15 metres of the premises where the process of mixing is being done.

27. The cap sensitivity of the field-mixed ammonium nitrate/fuel oil mixture should be tested at regular intervals. (The test is as follows: Insert an electric detonator in the cartridge, sack or other package of mixed fuel/ammonium nitrate (or any other approved composition) placed on soft grount in an isolated area provided with an amply safe guarded spot for the shotfirer and others, and fire the detonator. A crater in the ground indicates a cap-sensitive mixture).

Charging and Firing:

28. As soon as is possible after the mixing of ammonium nitrate with diesel oil, the holes to be blasted should be charged and fired, and all normal practices of charging and firing of explosives as laid down in the Regulations should be observed.

29. The ammonium nitrate fuel oil (ANFO) mixture may either be poured free in dry conditions of use, or it may be packaged in polyethylene bags for use in wet holes.

30. When poured free, a suitable funnel of fibre board or wood may be inserted over the shot hole for charging the mixture, and a wooden stemmor may be used to aid the flow.

31. Since the mixture is not as sensitive as conventional high explosive, detonating fuse can not be relied upon to initiate it. Primer cartridges of high explosive equal to 5 to 25% of the total charge should therefore be used. (A small diameter hole will require a high proportion by weight of the initiating charge). All initiating and booster charges should, as far as possible, be of the non-nitro-glycerine type. In holes of 0.1 metre (4" dia) diameter or less only one line of detonating fuse should pass through the mixture.

32. Before entering a blast area, the Overman/Shotfirer and other personnel should make certain that it is completely free of visible reddish brown fumes, which is an indication of highly toxic concentrations of nitrogen dioxide gas. Where fumes are observed after blasting, an adequate period of time should be allowed for them to disperse before returning to the blasting area.

Fighting Fires Involving Explosives:

33. If high explosives are in the same premises where AN or ANFO fire is underway first attempt should be to remove high explosive from the danger area. If this is not possible, the entire area may be evacuated in anticipation of detonation and the fire should be allowed to burn.

Underground Applications:

34. ANFO should not be used in underground coal mines.

Hazard of Static Electricity:

35. In pneumatic loading of small dia. Holes, premature initiation of priming charge is quite possible. For this pneumatic loading equipment should be properly grounded. The hose connecting the loading machine to the charging hole should be semi-conductive, having a total resistance low enough to permit dissipation of static electricity and high enough to limit the flow of stray electric currents to safe level. Wire countered hose should not be used because of the potential hazard of stray electric currents. On the basis of available information it

appears that semi-conductive hose having a resistance of not less than 5000 ohms per 0.3 m. with no more than 2 mega ohms for the total length is satisfactory.

Supervision:

36. The entire operations of mixing of ammonium nitrate and diesel oil on-site near the place of its use, and its charging and blasting in the shot holes should be placed under the overall charge of a competent person, holding a managers certificate or Foreman's/Overman's Certificate and appointed in writing by the Manager for the purpose.

194.Deep-hole blasting-.**Conditions For Deep-Hole Blasting In Opencast Coal Mine**

GENERAL

1.0 The owner and agent of an opencast mine shall ensure that a prior scientific study is conducted in designing deep hole drilling and blasting system for the mine taking into consideration all mining parameters and machinery parameters which could have adverse impact on ground vibration in and around the mine and long-term stability of slope of opencast workings and dump yards.

2.0 The Owner and Agent of the mine where deep hole drilling and blasting is proposed shall indemnify the occupants/owners of houses / dwellings / buildings or other structures and the public authority concerned, if any, against danger to their property or injury to them or other persons, arising out of the operations conducted in respect of deep hole drilling and blasting.

3.0 The Owner, Agent or/and Manager of the mine where deep hole drilling and blasting is proposed shall ensure the following:—

a) Only properly trained persons who are authorised in writing by the manager for the purpose are deployed.

b) Adequate personal protective equipments as required to be used by persons deployed in this connection are provided and also used.

c) Adequate scientific equipments for measurement of the health of machinery deployed, ground movements and various blasting parameters like ground vibrations, noise, etc., are provided.

4.0 The entire operations of conduct of safe deep-hole drilling and blasting operations in the mine including transport of the explosive to the site of its use, shall be placed under the overall charge of a competent person holding First class manager's certificate, hereinafter referred to as "Blasting Officer", duly appointed in writing by the manager for the purpose. He shall be assisted in operations connected therewith by adequate number of persons holding atleast an Overman certificate of competency, who are duly authorized in writing by the Manager and are fully trained in deep hole drilling and blasting techniques.

DRILLING OF DEEP-HOLES

5.0 Before commencement, the position of every deep hole to be drilled shall be distinctly marked by an Overman working under the direct control of the Blasting Officer so as to be readily seen by the Driller.

6.0 No drilling shall be commenced in an area where shots have been fired, until the Shotfirer has made a thorough examination at all places, including remaining butts of old deep holes, for unexploded charges that a drill may strike.

7.0 No drill or bore rod or pick shall be inserted in butts of old deep holes even if an examination has failed to reveal presence of explosives.

8.0 Drilling operations shall not be carried on simultaneously on two benches, at places directly one above the other.

9.0 Wherever, drilling operations are being carried out, charging of already drilled deep holes shall not be carried out in the same area at the same time.

CHARGING AND STEMMING

10.0 During the approach and progress of an electric storm, no charging and blasting shall be done.

11.0 No shot hole shall be charged in crushed, broken or fractured ground strata.

12.0 All detonators and primed cartridges shall be kept in secure receptacles at a safe distance from the detonating fuse and the explosive, until actually required for use.

13.0 Charging of explosives shall be such as to ensure continuity of the explosive column. Where deck charging is done, continuity shall be ensured for each deck of explosive charge.

14.0 Primer explosive cartridge shall not be slit or deformed.

15.0 Adequate amount of cap sensitive explosive shall be used with non cap-sensitive explosive charge to ensure complete detonation of the explosive charge.

16.0 In case, water is encountered in any shot-hole, either the shot hole shall be dewatered by blowing compressed air into the hole or the explosive column shall be gently pushed down by wooden rod and sufficient time given for the explosive column to sink to the desired depth before the round is fired. Decking in watery holes shall be avoided.

17.0 The charging of holes shall be carried out in day light hours only.

FIRING OF SHOTHOLES

18.0 Shots shall not be fired except during the hours of day light.

19.0 The manager shall fix the blasting time and shall circulate it to all concerned and display it prominently on the notice Board and at conspicuous places in and around the mine.

20.0 The danger zone shall be distinctly demarcated (by means of red flags properly arranged and supported) at least 30 minutes before firing of holes is done.

21.0 All holes charged on any one day shall be fired on the same day. However, in case of specific problems which may lead to the charged holes to sleep overnight, the following conditions shall be strictly complied with.

(i) Explosives charged shotholes in coal faces and the overburden bench immediately above coal seam SHALL NOT be kept sleeping and shall be blasted off on the day of charging.

(ii) The total duration of sleeping of holes with explosives shall not exceed the hours as designated by the Manager in writing after consultations with the manufacturer of the explosive(s).

(iii) Elaborate standing orders shall be formulated by the Manager on the various precautions to be taken during the sleeping of shotholes. The standing orders shall clearly spell out the responsibilities of various officials and supervisors including the Blasting Officer of the mine in maintaining the sleeping shotholes in safe condition.

(iv) Before deciding to allow shotholes on sleeping at any place in the mine other than the coal benches and the immediate overburden bench over the coal seams, care shall be taken to ensure that there is no heating of strata anywhere along the depth of the shotholes. Details of bottom hole temperatures of all shotholes proposed to be charged with explosives and later kept sleeping shall be recorded. For regularly monitoring the bottom hole temperature for any increase, a few pilot holes shall be left uncharged. If the bottom hole temperature shows any sign of abnormal increase, then immediate steps shall be taken to blast all the shotholes at the earliest. The details of all such abnormal increase of temperature, shall be recorded in the register separately kept for the purpose and also signed and dated by the blasting officer and the Manager.

(v) The area where the shot holes are kept sleeping with charged explosives shall be conspicuously marked by such an arrangement which could be clearly visible during any time of the day or the night.

(vi) No person shall be allowed to be present anywhere within 100 m of the shot holes sleeping with explosives. The entrance to such areas shall be effectively cordoned off to prevent any inadvertent and unauthorized entry.

(vii) The fuse wire emanating out of the shot hole charged with explosives shall be covered with any incombustible material so as to prevent any accidental ignition due to the influence of static electricity form lighting etc.

(viii) Adequate arrangement of water under high pressure shall be made available near the area of sleeping of shot holes for dealing with any exigencies, including flushing out of charged explosives from the shot holes and for de-sensitizing the explosives in the charged shot holes.

22.0 The area of explosives charged shot holes shall be conspicuously marked by visible bright red flags. 23.0 Blasting shall be done preferably against a free face.

Blasted material shall be cleared off before commencement of drilling operations for succeeding round.

MISCELLANEOUS

24.0 A proper record of blast parameters like spacing & burden of holes, hole depth, number of holes fired in the round, charge/hole, charge/delay, charge/round, length of explosive column(s) & stemming column length(s), initiation pattern (with proper sketches wherever called for), results of ground vibration observed (ppv, frequency & air over pressure) and distance upto which flying fragments resulting out of blasting projected, shall also be kept maintained in a bound paged book for each round of deep-hole shots fired. The records shall be duly signed by the Blasting Officer and countersigned by the Manager of the mine. 25.0 The Manager of the mine, after thorough consultations with the OEM and explosives manufacturers, shall formulate suitable Codes of Practice in respect of drilling, charging, stemming, warning of persons, taking shelter, and firing of shots.

"deep-hole drilling and blasting" means drill holes more than three meters in depth and used for blasting in an opencast mining operation;

195. Electric shot-firing.– (1) No shot shall be fired except by means of a suitable shot-firing apparatus of a type approved by the Chief Inspector and the number of shots fired at any one time by the apparatus shall not exceed the number for which it is designed.

(2) Every electrical shot-firing apparatus shall be so constructed and used that – (a) it can only be operated by a removable handle or plug; (b) the handle or plug shall not be placed in position until a shot is about to be fired and shall be removed as soon as a shot has been fired; (c) the firing circuit is made and broken either automatically or by means of a push-button switch.

(3) No shot-firing apparatus shall be used which is defective and every apparatus shall once at least in every three months, be tested by a competent person to ascertain whether it is in safe working order.

(4) If the apparatus fails to fire all the shots in a properly connected circuit, the shot-firer shall return the apparatus to the manager or assistant manager as soon as possible, and it shall not be used again unless it has been tested on the surface and found to be in safe working order.

(5) The result of every test made under sub-regulations (3) and (4) shall be recorded in a bound paged book kept for the purpose and shall be signed and dated by the competent person making the test.

(6) No current from a signalling, lighting or power circuit shall be used for firing shots.

(7) The shot-firer shall-

(a) retain the key of the firing apparatus in his possession throughout his shift;

(b) use a well-insulated cable of sufficient length to permit him to take proper shelter and in case of belowground working sufficient to take two right angle turns of pillar, and in no case, shall this cable be less than 50 meters in length;

(c) before coupling the cable to the firing apparatus, couple up the cable himself to the detonator leads;

(d) take care to prevent the cable from coming into contact with any power or lighting cable or other electrical apparatus;
(e) take adequate precautions to protect electrical conductors and apparatus from injury;
(f) himself couple the cable to the firing apparatus and before doing so, see that all persons in the vicinity have taken proper shelter
(g) after firing the shots and before entering the place of firing, disconnect the cable from the firing apparatus.
(8) Where more than one shot are to be fired at the same time,-
(a) care shall be taken that all connections are properly made;
(b) all shots, if fired belowground, shall be connected in series;
(c) the circuit shall be tested, either for electrical resistance or for continuity, before connecting it to the firing apparatus
(d) the cable to the shot-firing apparatus shall be connected last;
(e) detonators of the same electrical resistance shall only be used.

Specification of cable for shot-firing

a) Cable for single shot-firing – Two core cable, each core consisting of a conductor of atleast four copper wires of not less than 0.018 inch in diameter.
b) Cable for multi shot-firing – Single core cable, each core consisting of a conductor of at least three copper wires of not less than 0.036 inch in diameter, insulated to withstand 250 volts.
c) Cable for shot-firing in shafts – Two core cable, each core consisting of a conductor of at least seven copper wires of not less than 0.029 inch in diameter, insulated to withstand 250 volts.

(Cir. 70/1966)

Maintenance and Repair of Exploder

Exploder shall be cleaned and overhauled at least once in every three months. After every repairing shall be check-tested and that check-test shall not show:

a) Duration of current impulse more than 4 millisec.
b) Output voltage variation more than +1% of rated voltage, or
c) Any residual current

(Cir. 43/1972)

Circuit Tester- Gyro Ohm meter has been approved by DGMS for the purpose of testing circuits in a safe manner in a mine.

(Cir. 3/1973)

196. Taking shelter before firing shots.– (1) The shot-firer shall, before a shot is charged, stemmed orfired, see that all persons other than his assistants, if any, in the vicinity, have taken propershelter and he shall also take suitable steps to prevent any person approaching the shot andshall himself take adequate shelter, along with his assistants if any, before firing the shots.

(2) In the case of an opencast working the shot-firer shall not charge or fire a shot–

(b) Unless sufficient warning, by efficient signals or other means approvedby the manager, is given over the entire area falling within a radius of 500m from the place of firing (danger zone) an also he has ensured that all persons within such area have taken proper shelter.

(3) When two working places belowground have approached within 9m of eachother, the blaster shall not fire any shot in any one of the said workings unless all personshave been withdrawn from the other working place and the same has been so fenced off as toprevent persons inadvertently coming in direct line of the shot.

Simultaneous blasting in opencast workings- where a number of shotfirers are employed in proximity to each other(i.e. 300m), only one shotfirer at a time may fire shots, and the interval between two shot firers firing shots should not be less than 30 minutes.

(Cir. 1/1967)

Inadequacy of one right angle bend in shelter- Due to reflection of fragmented particles there have been several accidents occurred in mines causing injury to the persons taking shelter. So taking two right angle bends for shelter would keep the people out of danger.

(Cir. 16/1970)

197. Precautions against dry coal dust.- No shots shall be fired at any place belowground unless the place itself and all accessible places, including roof and sides, within a distance of 18 meters have been treated with water in such manner and at such intervals as will ensure that the dust on the floor, roof and sides and on any support or structure is always combined with not less than 30 per cent by weight of water in intimate mixture

198. Conditions requiring use of Permitted Explosives – (1) Notwithstanding anything contained in these regulations, no shots shall be charged or fired in the belowground working if the explosive used is not a permitted explosive, except in–
(a) a stone-drift, if it does not contain dry coal dust; and
(b) a shaft which is in the course of being sunk.

(2) In a gassy seam of the second or third degree no explosives other than the permittedsheathed explosives or other explosives equally safe or any device or apparatus for breakingcoal approved by the Chief Inspector shall be used while in a gassy seam of the first degreepermitted explosives may also be used.

Provided that the Chief Inspector may by any order in writing and subject to such conditionsas he may specify therein permit in any gassy seam of the first degree the use of anyexplosives other than the permitted explosives.

(3) Notwithstanding anything contained in sub-regulation (1), if blasting is done in any stone drift or sinking shaft within five meters of any coal seam or in coal measure drifts or staple shaft from one seam to another only permitted explosives of such types as may be required by the Chief Inspector shall be used:

Provided that in case of special difficulties, the Chief Inspector may exempt any stone drift or sinking shaft from the provisions of this sub-regulation subject to such conditions as he may specify therein.

Extra Shots

Reason for using permitted explosive in underground coal mines

Methane explosion is known to take place due to the following reasons when explosive is in use:

a) Direct action of shock wave from explosive.
b) Indirect action of shock wave after it has been reflected from solid surfaces in vicinity of explosives.
c) Hot gaseous products of detonation mixing with the methane-air mixture.
d) Hot reacting solid particles of explosives getting ejected into the methane-air mixture.

Hence specially designed explosive and detonators are required for use in underground coal mines. Such products come under the permitted category.

199. Precautions in the use of Permitted Explosives —(1) No detonator shall be used, unless it is of a type approved by the Chief Inspector.

(2) where more shots than one are charged for firing, the shots shall be fire simultaneously.

Extra shots

Solid Blasting

- Permission has to be sought from DGMS .
- Only P5 Permitted Explosive and 'Non-incendive' copper short delay detonator shall be used.
- Maximum charge per hole is 1000gms for Deg. I and 565gms for Deg. II & III mine.
- Delay between first and last shot shall not exceed 150ms (100ms for Deg. III mine)
- Delay between any two consecutive shot shall not exceed 60ms.
- The maximum distance between the two adjacent shot holes of different delays shall not be less than 60cm.
- Atleast 284 m^3/minute of air per minute shall be conducted upto every face where solid blasting is done (in Deg. III more than 300 m^3/minute) .
- Before blasting inflammable gas test should be done upto 20m radius.
- Water shall be sprayed within 90m of face .
- More than 25 shots should not be blasted in one round.

- No solid blasting shall be done when a geological disturbances has been detected or methane exceeds 0.5%.

201. Additional precautions in belowground mines -

(1)If in a ventilating district, presence of inflammable gas is detected in any place, no shothole shall be charged, stemmed or fired in that place or in any other place situated on its return side till such place has been cleared of gas and declared safe.

(2) Immediately before charging a shothole or a round of shotholes, and again before firing the shots the shotfirer shall carefully test for inflammable gas at all places within a radius of 18 m of the place of firing.

(3) No shothole shall be charged if any break is found therein, or if inflammable gas is found issuing therefrom.

(4) If after charging a shothole, inflammable gas is found in any place within the prescribed radius no shot shall be fired until the place has been cleared of gas and declared safe.

(5) No delay-action detonator shall be used, except with the previous permission in writing of the Chief Inspector and subject to such conditions as he may specify therein.

202.Blasting in fire areas in opencast mines.-Conditions for conducting blasting in fire areas in an opencast coal

1. Blasting operations shall be carried out under direct supervision of an Assistant manager in charge of Blasting operations.
2. Persons trained in the job of blasting in Fire area only shall be deputed for the said operation.
3. No explosive other than slurry or emulsion explosives shall be used.
4. Blasting shall be done with detonating fuse down the hole.
5. Temperature inside the blast holes shall be measured (before filling with water) and if the temperature exceeds 80°C, in any hole, such hole shall not be charged. Records of measurement of temperature in each hole shall be maintained in a bound paged book and shall be signed by the Assistant managerincharge of Blasting operations and countersigned by manager.
6. All blast holes shall be kept filled with water. When any hole is traversed by cracks or fissures, such hole shall not be charged unless it is lined with an asbestos pipe and the hole filled with water. In addition, bentonite or any other effective material shall be used for sealing any cracks at the bottom of the holes.
7. Detonating fuse shall not be laid on hot ground without taking suitable precautions which will prevent it from coming in contact with hot strata.
8. Hottest holes shall be loaded last. Uncharged holes shall be filled with water/ sandy material.
9. Carbonaceous material shall not be used for stemming.

10. The charging and firing of the holes in any one round shall be completed expeditiously and in any case within 02 hours.

11. Regular monitoring of Carbon Monoxide (CO) shall be done by a competent person authorized by the manager, during charging of the holes. If CO is more than 50 ppm, all persons from the area shall be withdrawn.

12. Water spraying/quenching arrangements shall be kept available at the blasting site to deal in case of emergency.

13. Precautions while drilling in Overburden or Coal over the underground workings in Opencast Mines.

A. Where the underground workings are accessible: Before commencement of blasting operations in the quarry:

(1) Such workings shall be surveyed and cleaned of coal dust and thickly stone dusted. *All persons shall be withdrawn from the underground in the same working seam or any other seam or section connected therewith and no work person shall be re-admitted into the said underground workings unless the same have been inspected by a competent person duly authorized for the purpose by the manager and found free from any noxious gases and or signs of fire, etc.*

(2) The underground workings to be quarried shall have sufficient thickness of horizontal barrier as stipulated in the Regulation 121(2) otherwise shall be isolated by explosion proof stoppings such as to withstand the force of vibration of blasting, from any active working area either in the same or different seam or section or /mine as the case may be, so as to prevent transfer of danger of blasting to the said active underground workings.

B. Where the underground workings are not accessible: Before commencement of blasting operations in the quarry: Such workings shall be treated with incombustible dust ahead of the quarry face fed through surface boreholes and dispersed by compressed air. The following procedure is recommended for treating the inaccessible workings underground with stone dust: (a) Ahead of the bottom bench in overburden, holes shall be drilled 18 metre apart in grid pattern from top bench in overburden or surface to the underground galleries. The distance between the 1st row of holes and quarry face should be 06 metre or less.

(b) After holing through of the galleries in coal, the drill rod shall be withdrawn and at least 2 tonne of stone dust fed through the borehole.

(c) The drill rod shall then be lowered through the borehole again so that it is well in the heap of stone dust dropped on the floor of the underground galleries.

(d) Compressed air shall then be blown at the rate of not less than 20 cu. m. per minute under pressure of at least 3.5 kg/ cm2 for a minimum of 45 minutes. This time can be proportionately reduced if compressed air at higher pressure is available.

(e) The steps (b), (c) and (d) shall be repeated with 02 tonne or more of stone dust dropped in each hole.

(f) If perimeter of galleries exceeds 14 m, the quantity of stone dust dispersed shall be proportionately increased by repeating the whole process a second time.

(g) For greater effectiveness, the holes shall be drilled in the junctions of the galleries.

(h) For better dispersability, it is desirable to use pure limestone dust or dolomite dust with least possibly silica content. The stone dust should preferably be water-proofed in humid and wet conditions.

(i) It shall be possible to improve the efficiency of the operation by fabricating special equipment or device which would enable the stone dust to be airborne near about the mouth of the borehole instead of dumping the stone dust at the bottom of the hole and then attempting to disperse it with compressed air as outlined in the procedure given above.

Note: None of the holes put down for stone dusting the underground workings are to be utilised for any other purpose, except for determining the thickness of overburden, etc. and other monitoring purposes.

C. General Precautions:

(1) **Surveying:** Before commencement of the drilling of shothole over the underground workings in the opencast mine, surveying shall be done to legibly mark the galleries, pillars & staple pits in the blasting area.

(2) **Location of holes:** The holes drilled in the overburden bench lying immediately above the coal seam (referred to hereinafter as last overburden bench) shall not lie immediately above the galleries in order to ensure that the blast-holes do not directly fire into the underground workings.

(3) **Safe parting:** The depth of holes in the last overburden bench shall be such as to leave atleast 6m thick overburden above the coal seam, and to ensure compliance with this requirement, a pilot hole shall be put for each round of blasting to determine the total thickness of overburden over the coal seam.

(4) **Compacting of the galleries:** After blasting the last overburden bench over developed galleries, loading operations shall not be started till the blasted area is fully compacted to prevent any chance of pot holing and declared free from any fire and safe by the blasting officer. Special care is to be taken to fill the shafts or staple pits whether vertical or inclined.

(5) **Workings developed in more than one section:** Where more than one section of the seam had been developed on pillars, the shot holes shall not be

drilled to within 03 m of a lower section, and care shall be taken that the blast holes do not directly fire into any underground gallery.

(6) **Delay detonators not to be used:** Unless otherwise permitted by DGMS in writing and subject to such conditions as may be imposed, no delay action detonators shall be used in coal, and the manner of extraction of pillars shall be by drilling and blasting holes in coal pillars only from top downwards.

(7) **Use of water ampoules/moist sand:** All holes in the last overburden bench and/or in coal shall be charged with water ampoules or with moist sand of at least 0.6m in length at the bottom of the hole.

(8) Where there is any doubt and particularly where there are cracks and crevices, the bottom 2m length of the hole shall be filled with sand.

(9) No person including shot-firer shall take shelter within 100 m of the quarry opening and such shelters shall be of stable and strong construction to provide safe shelter to the shotfirer and his helpers.

(10) Sleeping of holes shall not be permitted.

(11) No PETN/TNT based cast booster shall be used for initiating non-cap sensitive slurry/emulsion explosive in coal benches and overburden benches of a fiery coal seam.

(12) Overburden benches immediately above the coal seams and other fiery areas in the mine, the explosive charge shall be fired by detonator attached to the detonating cord at the surface and not within the shot hole.

(13) All explosives, cast boosters, detonators and detonating cord shall be subjected to proper testing in an approved laboratory in respect of temperature sensitivity, impact sensitivity for safe handling in mines. A certification to that effect shall be supplied for each batch.

Extra Shots

Slurry Explosive	Emulsion Explosive
components :- oxidizer+fuel oil + sensitizer	components :- oxidizer+fuel oil +emulsifying agent
VOD- 3500-4000 milli/sec	VOD- 4500-5000 milli/sec
Water resistance less than emulsion	More water resistance
In liquid and semiliquid form	In Liquid form

203. Inspections after shotfiring. –After a shot has been fired, the shot-firer shall not enter or allow any other person to enter the place until the atmosphere in the area is free from dust, smoke or fumes.

"socket" means a shot hole or blast hole or part thereof remaining after being charged with explosive and blasted, and which is not known to be a misfired hole;

204. Misfires. -(1) After firing the shots electrically, no person shall re-enter or be permitted to re-enter the place until five minutes after the source of electricity has been disconnected from the cable.

(2) In the event of a misfire, the entrance or entrances to the working place shall be fenced so as to prevent inadvertent access and no work other than that of locating or relieving the misfire shall be done therein until the misfire has been located and relieved.

(3) In opencast working, it shall be sufficient to mark the place of the misfire with a red flag.

(4) In the event of a misfire, a second charge shall not be placed in the same hole.

(5) If the misfire contains a detonator, the leads thereof shall be attached by a string to the shot-firing cable or some distinctive marker.

(6) Except where the misfire is due to faulty cable or a faulty connection, and the shot is fired as soon as practicable after the defect is remedied, another shot shall be fired in a relieving hole which shall be so placed and drilled in such a direction that at no point shall it be nearer than thirty centimeters from the misfired hole.

(7) After a relieving shot has been fired, a careful search for cartridges and detonators, if any, shall be made in the presence of the shot-firer, amongst the material brought down by the shot: Provided that in the case of working belowground if such cartridge or detonator is not recovered, the tubs into which the material is loaded shall be marked and further search made on the surface, and as far as possible, the search for the detonators and cartridges and the loading of any coal, stone or debris which may contain a detonator, shall be carried out without the aid of tools.

(8) If a misfired hole is not dislodged by a relieving shot, the procedure laid down in sub-regulations (6) and (7) shall be repeated.

(9) A misfired hole which cannot be dealt with in the manner so provided, shall be securely plugged with a wooden plug, and no person other than a shot-firer, an official or a person authorised for the purpose shall remove or attempt to remove any such plug. (10) When a misfired shot is not found, or when a misfired shot is not relieved, the shot-firer shall, before leaving the mine,- (a) give information of the failure to such shot-firer or official as may relieve or take over charge from him; (b) record, in a bound paged book kept for the purpose, a report on every misfire, whether suspected, and whether the shot-hole is relieved or not relieved; (c) sign the report and, to record in the said book the action taken for relieving the misfired shot-hole. (11) The shot-firer of the next shift shall locate and blast the misfired hole, but if after a thorough examination of the place, the place where the misfire was reported to have occurred he is satisfied that no misfire has actually occurred, he may permit drilling in the place.

(12)In case of opencast mines, the owner, agent and manager of a mine shall draw up a plan which shallinstruct all shot-firers the detailed procedure to be followed in the event of a misfired shot.

205. Special precautions in stone drifts – In stone drifts –
(a) after shots have been fired, all loose rock shall be removed from the face, and thearea lying within a distance of 1.2 m from the face shall be thoroughly cleaned or washed down with water and carefully examined for the presence of misfires or sockets. Unless the precautions herein specified have been taken, the next round of shots shall not be fired.

206. Duties of shotfirer at the end of his shift- Immediately after the end of his shift, theshotfirer-
(a) shall return all unused explosive to the magazine, or where a store or premises is provided under regulation 160, to such store or premises.

Damage of structure due to blast induced ground vibrations in the mining areas

Natural Frequencies

Elements of building construction such as sprung floors, stud partition walls, ceiling and windows can all react as mass-spring systems, each with its own natural frequencies of about 4-24 Hz (low frequencies) Ground vibrations at these frequencies amplified by the structures increase the risk of damage. When the low frequency ground vibration coincides with the natural frequency of the structure resonance in originated. *The resonance is a state in which the structure absorbs most energy progressively becoming deformed with time, until plastic deformation occurs.* Therefore even the low peak particle velocity of ground vibrations at natural frequency of structure is more harmful to the structure. Natural frequencies of brick and concrete structure generally vary from 8-16 Hz.

Structural response

Concrete structures vibrate for longer duration that brick and mud structures. Concrete walls have free top and show no cracks at vibration levels for which mud and brick walls can damage Cracks develop in concrete walls with large vibration level. Cracks in brick- structures can be observed in junction of walls, roof and at window corners. Brick walls with clay mortar and cement- sand mortar behave in same fashion. Steel structures can sustain more vibration level.

Measurement of blast induced vibrations

Instrument

The instrument selected for monitoring blast induced ground vibration shall be simple, light, compact, easily portable, battery operated, digital form output, triggering by geophone etc. Triaxial transducers for recording blast vibration shall have a liner frequency upto 500 Hz and capable of recording particle velocity upto 100 mm/s.

Factors Affecting Ground Vibration

Major factors affecting particle velocity of ground vibration are type and amount of explosive charge used, distance from the charge to the point of observation (surface structures), geological, structural and physical properties of the rock that transmits the vibrations, height of structures and blast geometry. Use of safe charge/delay, in hole delay with non- electric initiation systems. Proper burden, inclined holes in conformity with slope of bench, deck charge, air deck, sequential blasting, clearing off loose pieces of rocks from the blast site and proper stemming of holes bring reduction in blast induced ground vibrations. Controlled blasting methods in conjunction with effective muffling of holes will control ground vibrations and also arrest fly rock.

Extra Shots

V(peak particle velocity (mm/s) $= K (D/\sqrt{Q})^b$

Where,
D = distance between the blast and the monitoring station (m),
Q = maximum charge per delay (kg)
K and 'b' are the site constants.
Conventionally, $D/\sqrt{Q}$ is called scaled distance.

Permissible standards

Depending on the type of structures and the dominant excitation, the peak particle velocity (ppv) on the ground adjacent to the structure shall not exceed the values given below in the table.

Table: Permissible Peak Particle Velocity (ppv) at the foundation level of structures in Mining Areas in mm/s.

Type of structure	Dominant excitation Frequency, Hz		
	< 8 Hz	8-25 Hz	>25 Hz
(A) Building/structures not belong to the owner			
(i) Domestic houses/structures (kuchha, brick & cement)	5	10	15
(ii) Industrial Building (RCC & Framed structures)	10	20	25
(iii) Objects of historical importance & sensitive structures	2	5	10
(B) Building belonging to owner with limited span of life			
(i) Domestic houses/structures (kuchha, brick & cement)	10	15	25
(ii) Industrial Building (RCC & Framed structures)	15	25	50

(Cir Tech 7/1997)

Extra Shots

- **Deflagration** – Explosives have large amounts of chemically bonded oxygen in the molecule. If the amount of energy given to the explosive is not too high it will start burning and will not detonate . This is called a "deflagration".
  Deflagration of explosive is dangerous for underground coal mine, since they burn for longer period comparative to explosive which detonate.
- **Cap sensitive** means an explosive which explodes on initiation by a detonator of minimum strength.
- **Velocity of detonation (VoD)** is the velocity at which the shock wave front travels through a detonated explosive.

MULTIPLE CHOICE QUESTIONS

Explosive & Shot firing

1. A container for carrying explosive shall not contain more than _______ of explosive.
   a) 5 kg
   b) 10 kg
   c) 50 kg
   d) 2 kg
2. What is the permissible limit of Peak particle velocity at the foundation level of historical structure having dominant excitation frequency 20Hz?
   a) 2 mm/sec
   b) 5 mm/sec
   c) 10mm/sec
   d) 15mm/sec
3. In the event of misfire relieving hole shall be drilled, not nearer than _____
   a) 60 cm
   b) 75 cm
   c) 30 cm
   d) 25 cm
4. Reserve station is a place in belowground mine where explosive is kept for ________
   a) Whole day
   b) Only to be used during a shift
   c) Any no of days
   d) None
5. All places lying within ________ of the reserve station shall be cleaned of coal dust.
   a) 90 m
   b) 50 m
   c) 18 m
   d) 20 m
6. No energized electric cable be allowed to pass within ________ from the reserve station ?
   a) 90 m
   b) 50 m
   c) 18 m
   d) 20 m

7. Drill used for boring a shot hole shall provide at least ________ clearance over the diameter of the cartridge of explosive.
   a) 0.5 cm
   b) 0.2 cm
   c) 0.3 m
   d) 0.3 cm
8. Which of the following shall not be used for stemming material?
   a) Coal dust
   b) Sand
   c) Clay
   d) Calcium di-chloride
9. Which of the following combination is recommended as stemming material ?
   a) 30% clay , 70% sand
   b) 70% clay , 30 % sand
   c) 50% clay, 50% sand
   d) 40% clay, 60% sand
10. Which of the following is not the reason for blown out shot?
   a) Excessive burden
   b) Sequence of firing shotholes
   c) Improper use of delay detonators
   d) Charge per hole
11. A blast hole shall not be charged , if temperature inside it exceeds ____
   a) 33.5^{0}C
   b) 30^{0}C
   c) 80^{0}C
   d) 100^{0}C
12. In case of blasting in hot strata , charging and blasting of shot hole shall be completed within ________
   a) 30 minute
   b) 90 minute
   c) 120 minute
   d) 150 minute
13. Sleeping holes are ________
   a) Misfired hole
   b) Charged but not fired on same day
   c) Shot holes in watery strata
   d) Uncharged holes
14. Exploder shall be cleaned and overhauled at least once in every ________
   a) Three months
   b) One month

c) Six month

15. What is the danger zone in opencast mine?

a) 300 m
b) 100 m
c) 500 m
d) 50 m

16. In an opencast mine where a number of shotfirer are employed proximity to each other, interval between two shot firing should not be less than ____.

a) 5 minute
b) 60 minute
c) 30 minute
d) 15 minute

17. In case of degree I gassy seam what is the maximum charge per hole for solid blasting?

a) 565 gm
b) 2 kg
c) 1 kg
d) 500gm

18. Delay between first and last shot hole in degree I mine for solid blasting shall not exceed ______.

a) 60 millisecond
b) 100millisecond
c) 75millisecond
d) 150millisecond

19. In solid blasting delay between any two consecutive shot shall not exceed ______ ?

a) 60 millisecond
b) 100millisecond
c) 75millisecond
d) 150millisecond

(20) What is the minimum quantity of air required at the face in degree III mies where solid blasting is done ?

a) 284 m^3/min
b) 300m^3/min
c) 110m^3/min
d) 200m^3/min

(21) Before carrying out solid blasting inflammable gas test should be done upto the radius of ______ from the face .

a) 18 m
b) 90 m

c) 50 m
d) 20 m

(22.) What is the maximum number of shots that should be blasted in one round in case of solid blasting ?

a) 10
b) 20
c) 25
d) 40

Answers

1.a 2.b 3.c 4.b 5.c 6.a 7.d 8.a 9.a 10.d 11.c 12.c 13.b
14.a 15.c 16.c 17.c 18.d 19.a 20.b 21.d 22.c

Machinery, Plant and Equipment

208. Use of certain machinery, equipment and devices in coal mines.- (1) No internal combustion engine or steamboiler shall be used belowground in a mine expect with the permission in writing of the ChiefInspector.

(2) In every gassy seam of the second or third degree, only flame proof electrical apparatusand equipment shall be used belowground.

Provided that the Central Government or the Chief Inspector or an Inspector authorised by the Central Government may, subject to such conditions as may be specified,permit the continuance of the use of non-flame proof apparatus or equipment for a specifiedperiod, not exceeding one year, in any mine of the first degreewhich has subsequently been classified as second or third degree gassiness.

(6)A copy of approval of every approved machinery, equipment and device being used shall be kept atthe office of the mine.

(7)Where machinery is used for lifting, pulling, drilling, other than by hand held drill, dinting, ripping,cutting, loading, hauling or dumping, safe code of practices separately for each type of machinery withrespect to the method of work, shall be framed by the person authorised for the purpose, containing codes for the control and guidance of persons employed for the erection, installation, operation, repairs,maintenance, dismantling and transportation of such machinery and ancillary equipment as well as for the prevention of accident and to provide for the safety, health, convenience and discipline of the persons so employed and the engineer authorised for the purpose shall be responsible for the implementation of above safe code of practices.

(8)Where surface transportation and handling machinery including coal handling plants, repair shedsor workshops are provided, safe code of practices for their erection, installation, operation, repairs,maintenance, dismantling and transportation of such machinery, plants and ancillary equipment as well as for the prevention of accident and to provide for the safety, health, convenience and discipline of thepersons so employed shall be framed by the person authorised for the purpose, and the engineer authorized for the purpose shall be responsible for the implementation of above safe code of practices.

210. Apparatus under pressure. – (1) All apparatus, used as or forming part of the equipmentof a mine, which contains or produces air, gas or steam at a pressure greater thanatmospheric pressure shall be so constructed, installed and maintained as to obviate any riskof fire, bursting, explosion or collapse or the production or noxious gases.

216. Design, operation and maintenance of heavy earth moving machineries (HEMMs) includingtrucks, tippers and dumpers.-.

Safety features and devices to be provided in Heavy Earth Moving Machinery (HEMM) including trucks and tippers.

1.0 General Requirements:

The following Safety features and devices shall be provided in all Heavy Earth Moving Machinery (HEMM):

A. Access:

(i) Safe access to the Operator Station and to routine maintenance points of HEMM shall be provided. Proper placement of components of the access system shall permit and encourage a person to usethree-point support while ascending, descending or moving about the access system, when morethan 1m above the ground. Two-point support is acceptable for stairs, stairways, ramps, walkwaysand platforms. Three-point support should be used for all ladder systems. Track shoe and track padsurfaces are accepted as access steps if three-point support is provided when the HEMM is in 'OFF'condition.

(ii) On machines with articulated frames and in the fully articulated steering position, a minimum clearance of 150 mm shall be provided between firm structures and components with relative movement in the path of the access systems to the operator's station.

B. Operator's Station (Cabin):

(i) Pipes and hoses that contain fluids at pressures exceeding 5 MPa or temperatures above 60 °C located inside the cab shall be suitably guarded.

C. Operator's protective Structures:

(i) All HEMM with a seated operator shall be equipped with a roll-over protective structure (ROPS). The ROPS shall comply with ISO 3471. Further, it shall also be fitted with FOPS, when they are intended for applications where there is a risk of falling objects. The fitted FOPS shall be in accordance with ISO 3449.

D. Steering System:

(i) An emergency steering system shall be provided which also function with reverse machine movement if the maximum rated speed in reverse exceeds 20 km/h.

E. Brake System:

All HEMM shall be equipped with the following brake systems and all these systems shall be effective under all conditions of service, load, speed, terrain and slope, according to the intended use of the machine:

(i) Service brake : to be used as the primary braking system during normal operation of the equipment.

(ii) Emergency brake - to be applied by the operator in the event of a failure of the service brake.

(iii) Parking brake - used to prevent movement of stationary equipment.

Provided that at least one of the brakes shall be "fail safe", i.e. the spring applied- hydraulically released (SAHR) or any other means. All HEMM shall have a brake system in accordance with ISO 3450 except for crawler machines with a travel speed less than 20 km/h, which shall have a brake system in accordance with ISO 10265.

F. Noise: The operator and persons near to the HEMM shall not be exposed to noise level that exceeds an eight hour equivalent continuous sound pressure level of 85 dB(A) and wherever it exceeds 85 dB(A), Personnel Protection Equipment (PPE) of adequate strength shall be used by the operators and the persons

"Heavy Earth Moving Machinery (HEMM)" means machinery used in opencast mines for digging, drilling (excluding hand held drills and drill machines capable of drilling hole of a diameter up to 50 mm), dredging, hydraulicking, ripping, dozing, grading, excavating, loading or transporting minerals or overburden.

"machinery" means – (i) any locomotive or any stationary or portable engine, air compressor, boiler or steam apparatus which is, or (ii) any such equipment used for cutting, drilling, loading and transport of material which is, or (iii) any such apparatus, appliance or combination of appliances intended for developing, storing, transmitting, converting or utilizing energy which is, or (iv) any such apparatus, appliance or combination of appliances if any power is developed, stored, transmitted, converted or utilised thereby is,used or intended for use in connection with mining operations.

MULTIPLE CHOICE QUESTIONS

Machinery, Plant and Equipment

1. With respect to braking system in HEMM match the following:

Type of Brakes		Function	
A	Service brake	P	To prevent movement of stationary equipment
B	Emergency brake	Q	Primary braking system
C	Parking brake	R	Applied after the failure of the primary brake

a) a-q,c-p,b-r b-r
b) a-r,c-p,a-q
c) a-p,c-q,a-r
d) a-p,c-r,a-q

1. The operator and persons near to the HEMM shall not be exposed to noise level that exceeds an eight hour equivalent continuous sound pressure level of ______

a) 85 dB(A)
b) 90 dB(A)
c) 140 dB(A)
d) 115 dB(A)

Answers

1.a 2.a

CHAPTER XVI

EXTRACTION OF METHANE FROM WORKING COAL MINE OR ABANDONED COALMINE

218.Notice of Intention or proposal of exploration for methane.- (1)Whenever there is any proposal or intention to explore for presence of methane, in any coal seam or coal measure strata of anyworking or abandoned coal mines or part thereof, with an objective to exploit the methane or any othergases for captive, domestic or industrial purposes, the owner, agent and manager of the mine shall, not less than six months prior to the date of start of such exploration work, give notice in writing in the Form and method as may be specified by the Chief Inspector for the purpose, to the Chief Inspector and also to theRegional Inspector:

Provided that in case of an abandoned mine, a notice of reopening shall also be submitted asspecified under these regulations.

(2) The notice so required under sub-regulation (1) shall be submitted along with-

(a)a pre-feasibility report prepared by an agency recognised for the purpose, having knowledge,experience and expertise in the required fields and subjects to explore such presence ofmethane;

(b)a report on the manner of exploration work proposed to be undertaken and the details oforganisation, agency and any other contractor by which all or the parts of the jobs areproposed to be carried out within such period as planned or proposed;

(c)details of machinery, equipment, instruments and apparatus along with their specifications,parameters and all relevant information, that are proposed to be used in the exploration work;

(d)persons and the category of persons including officials, competent persons, officers and staffwith organisation structure and chart clearly specifying duties and responsibilities thereof;

(e)plans and sections of the mine prepared adhering to general requirements under theseregulations, clearly showing the coal seams, coal measure strata, target seams and strata orthe places of the working or abandoned mines from where the methane is proposed to beextracted, their extent and all other details as required, present and future working fromwhere coal is or shall be extracted; and

(f)plans and sections of the area prepared adhering to general requirements under theseregulations, showing details of exploration work that is proposed to be undertaken indicatingthe proposed layout of the area over which drilling or any other exploration work are to beundertaken.

(3)The Chief Inspector may by an order in writing and subject to such conditions as may be specifiedtherein require any alteration, modification and additional requirements to be incorporated in theexploration plan or the project.

(4)No exploration plan or project as mentioned in sub-regulation (3) aforesaid shall be started orundertaken unless a written order or approval in that respect is obtained from the Chief Inspector.

(5)The date of starting of the execution of exploration plan or project shall be communicated forthwithto the Chief Inspector and to the Regional Inspector.

219.Submission of the exploration or abandonment of the exploration report.- (1)On completionof the exploration work in the mine or part thereof, a detailed exploration report complete in all respectsshall be submitted to the Chief Inspector and a copy thereof to the Regional Inspector:

Provided that an interim report, if so required by the Chief Inspector, shall also be submitted fromtime to time.

(2) If during exploration, it is decided to abandon or discontinue further exploration in the area, mine orpart thereof, a notice to that effect in the Form as may be specified by the Chief Inspector for the purpose,enclosing therewith the detailed exploration work carried thereon shall be submitted forthwith to the ChiefInspector and the Regional Inspector.

(3) The plans and sections prepared adhering to general requirements under these regulations, showing thedetails of all the boreholes drilled, abandoned or incomplete with details such as diameter, depth anddirection of every section of the borehole, extent of water, gas, etc., and any other information, shall besubmitted along with the report mentioned under sub-regulation (2).

(4) All the boreholes drilled or excavation made therein during exploration shall be effectively sealed orplugged so as to prevent any leakage of gas therefrom or any other gas or liquid matter flowing there intounless otherwise is required to be used further.

(5) A record of all such boreholes giving details as mentioned in this regulation shall be maintained in abound paged book kept for the purpose, duly signed and dated by the driller or drilling engineer, assistantmanager and countersigned and dated by the manager.

220.Notice of commencement of extraction of methane.- (1) Whenever there is any proposal or intention to commence or start extraction of methane from any coal seam or coal measure strata of anyworking or abandoned mines or part thereof, with an objective to exploit the methane or any other gases forcaptive, domestic or industrial purposes, the owner, agent and manager of the mine shall, not less than thirty days prior to the date of start of such extraction work, give notice in writing in the Form and methodas may be specified by the Chief Inspector for the purpose, to the Chief Inspector and also to the RegionalInspector.

(2)The notice so required under sub-regulation (1) shall be submitted along witha detailed projectreport prepared by an agency recognised for the purpose having knowledge, experience and expertise in therequired fields and subjects incorporating the following, namely:-

(a)the manner of extraction or exploitation work proposed to be undertaken and the details oforganisation, agency and any other contractor by which all or the parts of the jobs are proposed tobe carried out within such time period as planned or proposed.

(b)details of machinery, equipment, instruments and apparatus along with their specifications,parameters and all relevant information, that are proposed to be used;

(c)persons and the category of persons including officials, competent persons, officers and staff withorganisation structure and chart clearly specifying duties and responsibilities thereof;

(d)plans and sections of the mine prepared adhering to general requirements under these regulations,clearly showing the coal seams, coal measure strata, target seams and strata or the places of theworking or abandoned mines from where the methane is proposed to be extracted, their extent andall other details as required, present and future working from where methane as well as coal is orshall be extracted; and

(e)plans and sections of the area prepared adhering to general requirements under these regulations,showing details of exploration work that is already completed and also the remaining area overwhich drilling or any other exploration work are yet to be undertaken.

(3)The Chief Inspector may, by an order in writing and subject to such conditions as may be specifiedtherein, require any alteration, modification and an additional requirement to be incorporated in theextraction plan or the project.

(4)No extraction plan or project as mentioned in this regulation shall be started or undertaken unless awritten order or approval in that respect is obtained from the Chief Inspector.

221. Notice of closure, abandonment or discontinuance of extraction of methane.-

(1) Whenever thereis any proposal or intention to close or abandon or discontinue extraction of methane from any coal seam or coal measure strata of any working or abandoned mines or part thereof, the owner, agent and manager of the mine shall, not less than sixty days prior to the date of start of such closure, abandonment or discontinuance of extraction work, give notice in writing in the Form and method as may be specified bythe Chief Inspector for the purpose, to the Chief Inspector and also to the Regional Inspector.

(2)The notice so required under sub-regulation (1) shall be submitted with the following information,namely:-

(a)the reasons of closure, abandonment or discontinuance;

(b)plans and sections of the mine or part thereof prepared adhering to general requirements under these regulations, clearly showing the coal seams, coal measure strata, target seams and strata or theplaces of the working or abandoned mines from where the methane has already been extracted,their extent and all other details as required under these regulations, present and future workingfrom where methane as well as coal are likely to be extracted;

(c)plans and sections of the area prepared adhering to general requirements under these regulations,showing details of extraction work that is already completed and the conditions of all the boreholesand the part of working abandoned or discontinued; and

(d)protective work like sealing or isolation of working or any other work already completed and allthose work required to be done so as to make the area safe and secure in all respect.

(3)The Chief Inspector may, by an order in writing and subject to such conditions as may be specifiedtherein,requireanyotherworkas required tobe completed beforeclosure,abandonment,ordiscontinuation of such working, by the owner of the mine.

(4)If owner and agent fails to complete the remaining work required to be done before closure orabandonment or discontinuance of the working in a mine or part thereof, the Chief Inspector may get suchprotective work done by any other agency and the charges so incurred shall be defrayed from the owner asan arrear of land revenue.

222. Annual returns.- (1) On or before 1stday of February in every year, the owner, agent or managershall submit to the Chief Inspector and the Regional Inspector annual returns in respect of the precedingyear in the Form and method as may be specified by the Chief Inspector for the purpose.

223. Manner of extraction of methane.- (1) Owner, agent and manager of every mine from wheremethane is extracted, shall prepare a standard manner of extraction of methane from the target seam or thecoal measure strata and submit the same to the Chief Inspector for approval.

(2)If methane is proposed to be extracted from an abandoned or closed mine or part thereof, or from adiscontinued working of a mine or part thereof or from an existing working of a mine or part thereof, theowner, agent and manager of such mine shall also prepare a standard manner of extraction of methane fromsuch place and submit the same to the chief Inspector for approval.

(3)No extraction of methane from coal seam and the coal measure strata of a closed or abandoned ordiscontinued working of a coal mine or of a working mine or part thereof shall be done without permissionin writing and subject to such conditions as may be specified therein is obtained from the Chief Inspector.

224. Drill machine.- (1) The drill machine and each of its accessories shall, as far as practicable, be of non-inflammable material and any inflammable material, if used, shall be shrouded with substantial metallic covering to render it non-inflammable.

(4)Drill machine shall not be used at any work place where there is, after allowing for swing of the machine, clear space not less than the following, namely:-

(a)below the roof or its support 0.3 meter; and,

(b)on the sides 0.6 meter.

225.Drilling operation.- In connection with methane exploration or extraction activities in a belowground mine or part thereof :

Conditions and other details for conduct of Drilling Operations in connection with methane exploration or extraction in belowground coal mineGSR 991 (E) 1/10/18

I. Every drilling system shall have Safe Operating Procedures covering all the operations, repair and preventive maintenance including safety checks as per OEM recommendations.

II. An emergency plan shall be prepared considering the risks of spontaneous combustion, and hazardous gases and shall be implemented in case of emergency.

III. The power unit for the drill shall be kept in a fresh air entry.

IV. The drill machine shall be fitted with a gas monitor that alarmed at 1% methane and cut power to the rig when the sensor detected 1.25% methane. These monitors shall be periodically calibrated.

V. All boreholes drilled for degasification shall be accurately surveyed either during or after drilling is completed using commercially available borehole surveying tools. These boreholes shall be accurately plotted on mine plans to prevent any inadvertent mining through them.

VI. Suitable and sufficient material shall be available on site to seal boreholes in an case of emergency.

VII. Appropriate Personal Protective Equipment (PPE) shall be available at drilling site for workers.

227.Ventilation plan for methane exploration or extraction belowground.- (1) A ventilation plan asrequired under clause (d) of sub-regulation (1) of regulation 65 shall be maintained, showing in addition,the position of each exploration and production borehole and gas transportation pipe lines.

(2)Ventilation planning of the mine shall be done in consultation with the scientific body of repute,and quantity as well as quality of air reaching in each split and gallery through whichgas transportationpipe line passes, shall be fixed.

(3)Air measurement stations shall be fixed at each split through which gas transportation pipe linepasses in belowground working and air measurement at all such stations shall be taken in each shift and therecord thereof maintained in a bound paged book kept for the purpose, duly signed by the ventilationofficer and Assistant manager in-charge of the methane exploration or extraction operations and countersigned and dated by the manager of the mine.

(4)Whenever the normal ventilation of the mine is disturbed, all methane exploration or extractionactivities shall be stopped forthwith and work shall not be resumed till the normal ventilation of the mine isrestored.

(5)A coal barrier of not less than 150 meter in thickness shall be maintained in the same seam fromold boreholes and present working of the mine from where exploration or extraction of methane is inprogress.

(6)The ventilation plan and section required to be kept maintained under sub-regulation (1) shall be kept updated at specified intervals and shall be signed by the ventilation officer and assistant manager-in-charge of methane exploration or extraction operations, and countersigned and dated by the manager.

228.Water and gas separation.- Water separation and removal equipment shall be installed at eachdegasification hole, at lower points in the main gas pipe line.

229.Welding, cutting or fusion, etc.- In connection with methane exploration or extraction activities in abelowground mine or part thereof, a flame or electric welding, cutting or repairing apparatus may be used ifprior permission in writing has been obtained from the Regional Inspector and subject to such conditions ashe may specify therein.

230. Methane gas transportation belowground.- Conditions and other details for methane gas transportation in belowground

1. The pipelines shall be designed in a manner that ensures adequate safety under all conditions likely to be encountered during installation, testing, commissioning and operating conditions. All materials and equipment shall be selected to ensure safety and suitability for the condition of use, required flow rate to be transported and Operating pressures and temperatures.

2.0 All pipelines, valves, flingers, equipment or other material fittings that are meant to be used at the pipeline shall conform to API, ANSI, ASA & BIS (Pipe Fittings - as per ANSI B 16.5, Valves - as per API 6D Std. Ball Valves) and shall be of such type, standard and make as recognized or approved by the Chief Inspector of Mines.

3.0 The number of flanged on threaded joints for station piping shall be to the extent minimum. The threaded joints, after tightening, may be seal welded. Flanges shall conform to ANSI B 16.5 or ASME B 16.47 or MSS-SP 44 or equivalent.

4.0 The flange joint shall be provided with either spiral wound metallic gaskets or metallic ring type gaskets, depending upon the piping class. Plain asbestos sheet / reinforced gaskets shall not be used.✓

5.0 Materials for use in the pipeline system shall comply with the design and service requirements and shall be suitable for the intended fabrication and/or construction methods.

6.0 Adequate precautions shall be taken to protect the pipeline from washout, erosion, ground movement, falls, excessive load, impact, vibration or other likely hazards, which may cause serious movement or damage to the pipeline(s).

7.0 While laying a new pipe lines or making any alteration in existing pipe line in any mine, an underground Woking plan of the area where the pipe line is proposed to be laid showing the extent and route of the pipe line shall be prepared and kept in the mine.

8.0 When any pipeline has been commissioned, the owner , agent manager of the mine shall forthwith submit self-certification in support of complying with the requirement and communicate the actual date of commissioning to the Regional Inspector.

9.0 The pipeline shall be laid, operated and maintained in a safe manner so as not to cause any damage to life, person or property. There shall be adequate arrangements & safety devices for:

a) Protecting the pipeline from pressure in excess of which it is designed.

b) Prevention from internal corrosion

c) Communication and procedures in respect of any emergency in the event of leakage, breakage, fire or other accident.

10.0 Pipeline, pipe fittings and valves shall be installed, supported and maintained in such a manner so as to safely withstand stresses imposed on them by internal and external loads, and by contraction, expansion and vibration.

11.0 All welding jobs shall be carried out as per API 1104 followed by 100% radiographic examination or other suitable technique.. Similarly 100% radiographic examination will be carried out in the tie-in joints. The result of examination shall be recorded in bound paged book kept for the purpose and shall be signed and dated by the person carrying out the examination and shall be countersigned by the manager.

12.0 The sectionalising valves shall be installed where require for operation and maintenance and control of emergencies. The sectionalisation valves shall be provided on the based on risk assessment survey to limit the hazard and damaged from accidental discharge from pipe line and facilitate repair and maintenance of the pipe line.

13.0 Non-return valve of proper rating and high pressure isolating valves shall be provided at suitable points in each flow line.

14.0 Adequate & suitable instruments shall be provided for recording pressure, flow level etc. at suitable points.

15.0 Pressure safety valves and other suitable device of sufficient capacity and sensitivity shall be installed to ensure the normal operating pressure in the pipe line network.

16.0 Following tests shall be conducted during construction and laying of pipeline:

16.1 Air & Bubble Test - each section of the line, after assembly and before coating the field joints and tying in shall be tested to an interval pressure of not less than $7kg/cm^2$ (100psi) for as long as it may be necessary to enable the engineer in-charge to inspect all pipes, joints, valves, etc. Leaks shall be checked by application of suitable foaming agent or alternatively, by radiographic test of welds. Electrical testing of protective coating/insulation shall be performed as per ANSI/ASME B-31.3- 1982, API 1104 standards.

16.2 The result of every such test shall be recorded in a bound paged book kept for the purpose and signed and dated by the person making such test and shall be countersigned by the Mine Manager. 16.3 Before the pipeline is put into operation, it shall be subjected to hydraulic test at a pressure of at least 1.25 times the internal designed pressure or maximum working pressure likely to be attained at any point along with the pipe line.

16.4The test pressure shall be maintained for at least 24 hours except where specifically mentioned.

16.5 The result of every such test shall be recorded in a bound paged book kept for the purpose and signed and dated by the person making such test and shall be countersigned by the Mine Manager.

16.6 Similar test shall be made after every renewal or repair and in any case at intervals of not more than three years or at such shorter intervals as may be required. The result of every such test shall be recorded in a bound paged book kept for the purpose and signed and dated by the person making such test and the same shall be countersigned by the Mine Manager.

17.0 Necessary surveillance shut down facilities, pressure leveling device, and isolating block walls shall be provided, wherever required.

18.0 Adequate inspection and patrolling of the pipeline routes shall be carried out as often as necessary to ensure complete safety of the pipelines along their entire routes and all the vulnerable sections of the pipeline. A record of observations made by the Patrolling Team shall be kept maintained.

19.0 The entire length of pipeline shall be inspected once every month for detection of leakage. The result of such inspection shall be recorded in a bound paged book kept for the purpose and shall be signed and dated by the person making the inspection.

20.0 Workers employed for the routine operation of the transportation of Methane shall be made familiar with the layout of all the pipelines in the area and function of various

valves, so that not only during operation but also in case of an accident or any emergency, each can quickly and correctly operate the proper valves.

21.0 Adequate number of Automatic gas and leakage detectors fitted with audio visual alarms shall be provide at suitable locations to give warning in event of any leakage of inflammable gas or any other noxious gas from the pipe line in to the mine atmosphere. The detectors shall be inter-coupled with tripping device at permissible Limit.

22.0 Each pressure relieving devices installed on operating equipment shall be so maintained as to ensure proper functioning of the device at the designed pressure.

23.0 A detailed operation and maintenance procedure for control system and safety interlocks shall be developed for each pipeline section and station. Standard operating procedure shall be developed. The procedure shall include, system description, operation set points, activities like detecting , isolating and repairing a leak in the pipe line in safe and efficient manner normal operations, normal shut-down procedure, conditions under which emergency shut-down is required, etc.

24.0 Maintenance schedule, defining the duties and responsibilities of individuals in various working groups shall be formulated and implemented strictly, for ensuring timely action in detecting, isolating, and repairing a leak in the pipeline in a safe and efficient manner.

25.0 Such maintenance shall include testing, inspection and repair of the pressure, relieving device at such intervals as may be necessary.

26.0 Emergency procedure, shall be framed and submitted to the Directorate, specifying the action to be taken in the event of fire, uncontrolled escape of gas from the pipeline, bursting or damage to the pipeline.

27.0 Adequate number of self contained hand lamps of approved type shall be made and kept available for immediate use in case of emergency.

28.0 Pipeline system shall be monitored and controlled from SCADA to ensure effective and reliable control, management and supervision of the pipeline with an objective for:

(a) Real Time monitoring of various pipeline parameters like Pressure, Temperature, Flow, Status of equipment.

(b) Leak detection and leak location. (c) Remote control operations for Open / Close of valves during emergency shutdown.

29.0 Master Station (MS) should have the complete SCADA database and integrated alarm and event summary for overall operations management & control of the entire pipeline network.

30.0 Effective defect detecting systems like, pipeline patrolling / surveillance, visual / UT inspection, leak detection tests, internal audits, external audits etc. shall be put in place for detection of defects and damages of pipe work. Defective or Damaged pipelines shall be identified and restored to safe operating conditions by the use of appropriate repair methods as per this standard.

31.0 When a repair to a pipeline is made by cutting out a section of the pipe as a cylinder and replacing it with another section of pipe, the replacement section of pipe shall be pre tested to a pressure equal to 1.25 times the design pressure of the parent pipeline for minimum period of 4 hrs. prior to installation. Radiographic inspection shall be carried out on all tie-in-butt weld joints after the installation.

"pipeline" means a pipeline laid or being used in a mine for the purpose of pumping or supply of water, sand stowing or filling of material other than sand stowing, nitrogen flushing or for any other purpose including extraction of Coal Mine Methane (CMM), Abandoned Mine Methane (AMM) and other associated pipelines.

231.Sectionalisation of methane pipe lines.- (1)The main gas pipelines shall be sectionalised so that in the event of rupture in the pipeline, the methane gas in the general body of the air gets diluted within thepermissible limit.
(2)Sectionalisation shall be accomplished with automatic control valves which shall be of springloaded type and pneumatic valves that fail close.
(3)The tracer tubing shall be connected to pneumatic valve on each degasification hole, which shall beactivated (fail close) whenever pressure is lost in tracer tubing and also when the automatic control valveson the pipeline are actuated.

232.Methane and other gas monitoring system in case of positive pressure in reservoir.-
(1) Aproper automatic on line or continuous methane monitoring system fitted with audio visual alarm shall beinstalled along the gas pipelines.
(2)Methane monitors shall be placed at every five hundred meters interval along the main pipeline inthe return air way or at closer interval if so required by the Regional Inspector.
(3)Methane monitors shall be inter-faced to the electrically actuated valves attached to the tracer tubing.
(4)Methane monitoring system shall be provided with uninterrupted power supply arrangement.
(5)All air that cross or passes the pipe-line shall be monitored by methane monitors.
(6)Calibration of each methane monitor and the system so installed shall be done quarterly and recordof the same shall be maintained in a bound paged book kept for the purpose duly signed by the competentperson and counter signed by assistant manager-in-charge of methane exploration or extraction operationsand the manager.
(7)All gas monitors and automatic gas detecting system shall be of a type approved in writing by theChief inspector and the repairs and calibrations of all such monitors and system shall be undertaken only atan approved laboratory.

234.Inspection and examination of machinery and equipment for methane exploration andextraction.- (1)All the installations, pipelines and safety system installed shall be examined dailyby competent person authorised for the purpose and the results of all such examinations shall be recorded inbound paged book kept for the purpose duly signed by the competent person and countersigned by assistantmanager-in-charge of methane exploration or extraction operations and manager.
(2)Suitable log book shall be maintained wherein shall be recorded the repair or maintenance job inthe pipeline and other installations and the record of the same shall be kept in a bound paged book kept forthe purpose duly signed by the competent person and countersigned by assistant manager-in-charge ofmethane exploration or extraction operations and manager.

235. Responsibility of owner, agents, managers, engineers, competent persons and officials.- Theowner, agents, managers, engineers, competent persons and officials shall each be responsible for securingeffective compliance with the provisions relating to exploration or extraction of methane from coal seam,working or abandoned coal mine or part thereof.

"Abandoned Mine Methane (AMM)" means a natural gas recovered from abandoned coal mines or part thereof.

"Coal Mine Methane (CMM)" means a natural gas recovered from a coal mine or part thereof;

MULTIPLE CHOICE QUESTIONS

EXTRACTION OF METHANE FROM WORKING COAL MINE OR ABANDONED COALMINE

1. Notice of intention or proposal to explore for presence of methane in any coal seam to be given by owner, agent or manager to Chief inspector not less than _______ prior to the date of start of such exploration work.
   a. Six months
   b. Three months
   c. One month
   d. 90 days
2. Notice of proposal or intention to commence or start extraction of methane from any coal seam given by owner, agent or manager to Chief inspector not less than _________ prior to the date of start of such extraction work.
   a. Six months
   b. Three months
   c. One month
   d. 30 days
3. Notice of any proposal or intention to close or abandon or discontinue extraction of methane from any coal seam to be given by owner, agent or manager to Chief inspector not less than _________ prior to the date of such closure, abandonment or discontinuance of extraction work.
   a. Six months
   b. Three months
   c. Sixty days
   d. Thirty days
4. In connection with methane exploration or extraction activities in a belowground mine drill machine shall be fitted with a gas monitor that alarmed at _______ methane.
   a) 1 percent
   b) 0.75 percent
   c) 1.25 percent
   d) 1.5 percent
5. In connection with methane exploration or extraction activities in a belowground mine drill machine shall be fitted with a gas monitor that cut power to the rig when the sensor detected _______ methane.
   a) 1 percent
   b) 0.75 percent
   c) 1.25 percent
   d) 1.5 percent

Answers

1.a 2.d 3.c 4.a 5.c

Miscellaneous

237. Fences. -(1) Every tank or reservoir or other dangerous place in or about a mine, whichhas been formed as a result of, or is used in connection with, mining operations, shall be keptsecurely fenced.

(2) Every fence erected on the surface shall, once at least in every seven days, be examinedby a competent person.

Situation	Type of fencing to be used
Top of abandoned shafts or inclines, working inclines	S2
Top of abandoned quarries	S1 or S2
Top of working quarry	S3 or G2
Top of working shafts	G1
Moving & dangerous parts of machinery	G1 or G5
Entrance to goaves	U1
Disused galleries	U2

(Cir. 11/1959)

240. Use, Supply maintenance of protective footwear. – (2) The protective footwear shall be supplied free of charge, at intervals not exceeding six months, by the owner, agent or manager.

241. Use and supply of helmet.- 2) The helmet shall be supplied free of charge, at intervals not exceeding three years or such other interval as the Chief Inspector may specify by a general or special order in writing by the owner, agent or manager of a mine.

243. Use, supply and maintenance of self-rescuer – (1) No person shall go into, work or be permitted to go into or work belowground in any mine unless he is provided with and carries with him a self-rescuer of such type as may be approved by the Chief Inspector.

Course of training in the use of self -rescuer

Course of training: 1. Two lectures including demonstrations of not less than one hour duration each in every six months.

2. The following topics shall be covered in the training classes:

a. Brief about noxious gases which may present in the atmosphere of belowground coal mines.

b. The circumstances which will necessitate the use of self-rescuer.

c. Brief detail about the self rescuer.

d. Checks to be performed before taking self-rescuer like, external damage, colour indicator, broken seal, etc.

e. Correct wearing/donning procedure of self-rescuer.

f. Do's and don'ts during use of self rescuer.

g. Probable discomforts faced during the use of self-rescuer and remedy thereof.

h. Escape routes, refuge chambers/change over stations.
i. Practice with donning unit not less than 30 minutes.

Protocol on use, care, maintenance, sampling & testing of Self Contained Self Rescuers (SCSR) in coal mines

The committee of Ninth Safety Conference recommended' Use of Self Contained Self Rescuer(SCSR) in all degree III and degree II mines and in all fiery mines'

A. Use care and Maintenance

1. The owner ,agent and manager of a mine, with travel time of more than 30 minutes in belowground workings, shall ensure that adequate number(not less than the maximum attendance of the largest shift) of SCSR with rated duration of one hour shall be placed at suitably designed 'Safe Haven' or 'Refuge Chamber' located at convenient point(s). Whenever a person is required to work, supervise or visit belowground workings, he shall be provided and carry with him a SCSR of 30 minutes duration on his belt wherever he goes or works.
2. Contrary to the above, use of SCSR of rated duration less than 60 minutes and upto 30 minutes for a specific district or panel of the mine or mine may be permitted, on request of the Owner/Agent/Manager of the mine in writing , by the concerned regional Inspector of Mines.
3. Every SCSR on roll of the mine shall be subjected to 'Leak Tightness Test' , at least once in a quarter by a competent person.
4. Only one type of SCSR shall be preferred in a particular mine.

B. Sampling & Testing

1. Before a batch of Self Contained Self Rescuer (SCSR) is put into service, samples at the rate of three percent (3%) subject to a minimum of twelve units, for every batch of supply shall be drawn at random for the testing by a joint sampling team comprising of representatives from manufacturer/supplier and user at the user's.
2. 50% of the above sample(subject to minimum of 6 units) shall be sent to approved/accredited laboratory for full bench test and rest of the sample units shall be subjected to practical performance test.
3. The batch of supply for which all the tests results of the samples(100%) are found satisfactory shall only be put into service. In case of unsatisfactory test result even of a single sample, either at the laboratory or in the practical performance test, the entire batch of supply shall not be accepted for use.

C. Functional Ability

1. 1% of the total units of a particular make an type of SCSR under service shall be drawn randomly every year for tests, subject to minimum of one unit of each make and type, for functional ability.

(Cir. Tech 8 & 8A/2008)

251. Place of accident not to be disturbed.– (1) Whenever an accident occurs in or about a mine causing loss of life or serious bodily injury to any person, the place of accident shall not be disturbed or altered before the arrival or without the consent of the Chief Inspector or the Inspector to whom notice of the accident is required to be given under sub-section (1) of section 23 of the Act unless such disturbance or alteration is necessary to prevent any further accident, to remove bodies of the deceased, or to rescue any person from danger, or unless discontinuance of work at the place of accident would seriously impede the working of the mine: Provided that where the Chief Inspector or the said Inspector fails to inspect the place of accident within seventy-two hours of the time of the accident, work may be resumed at the place of accident. (2) Before the place of accident involving a fatal or serious accident is disturbed or altered due to any reason whatsoever, a sketch of the site illustrating the accident and all relevant details shall be prepared in duplicate and such sketch shall be duly signed by the manager or assistant manager, safety officers, surveyor and the workmen's inspector or, where there is no workmen's inspector by a work person present at the place of accident, which shall also be supported by the photographs of the place of accident: Provided that, if the place is disturbed or altered to prevent further accident or rescue persons from danger before the sketch could be prepared, the same shall be prepared immediately thereafter giving all relevant details as existed before the place was disturbed or altered. (3) One of the authenticated sketches shall be delivered or sent to the concerned Inspector

252.Emergency response and evacuation plan.– (1)The owner, agent and manager of every mineshall have a comprehensive programme in place to respond to any injury, illness or emergency that mayoccur at each mine including foreseeable industrial and natural disasters which shall include immediate first-aid treatment, medical treatment, transportation and evacuation of injured persons procedures torespond to emergencies that arise at the mine and make arrangements for the rescue of personsincapacitated or trapped in coal mines.

(2) The plan shall cover mine evacuations and include-

(a)establishment of individual responsibilities for administering actions identified to implement anemergency response;

(b)establishment of emergency communication systems, procedures and individual responsibilities forcarrying out emergency communications;

(c)a system in place to provide immediate notification to all persons affected by the emergency,including alarms in place which shall be capable of being seen and heard by everyone affected.

(d)a procedure to allow for the safe, orderly and immediate withdrawal of persons from the mine orarea of danger, including training on emergency escape routes and procedures;

(e)procedures in place to be followed by workers who remain to perform critical operations beforethey evacuate, which include-

(i)the selection of only those personnel who have received special training to respond tocritical operations and mine emergencies, including mine fires and explosions;

(ii)having procedures in place to ensure the locations that are safe for persons who would notbe immediately withdrawn;

(iii)having the personnel equipped with the necessary gas-detection equipments and otherequipments or tools necessary to respond to the critical operation at hand;

(f)providing persons with particular risks with the equipment necessary for escape, such as self-contained self-breathing devices, etc.;

(g)a response team that is trained and equipped and immediately available to respond to fires or otherhazards that create mine emergencies;

(h)procedures to account for all workers after the emergency evacuation is complete;

(i)providing relevant information and training to all personnel, at all levels, including regularexercises in emergency prevention, preparedness and response procedures and periodic emergencydrills;

(j)mock rehearsals at regular intervals.

(3) The owner, agent and manager shall submit a copy of the emergency response and evacuation planprepared by him to the regional inspector who may, by an order in writing approve such action plan, eitherin the form submitted to him or with such additions and alterations as he may think fit, and the action planso approved shall be enforced at the mine.

(4) On receiving information of any emergency, the owner, agent and manager, and in his absence, theprincipal official present at the surface shall immediately put emergency action plan in operation.

> *"principal official" means the senior-most mine official in mining discipline on duty in the mine*

255. Chief Inspector etc. to exercise powers of the Regional Inspector. – Any power grantedunder these regulations to the Regional Inspector may be exercised by the Chief Inspector oran Additional Chief Inspector or a Deputy Chief Inspector or any other Inspector authorised inwriting in this behalf by the Chief Inspector.

258. Appeals to the Chief Inspector.- Against an order made by the Regional Inspector underany of these regulations, an appeal shall lie to the Chief Inspector who may confirm, modify orcancel the order. Every such appeal shall be preferred within 15 days of the receipt of theorder by the appellant.

259. Appeals to committee–(1) An appeal against any order made by the Chief Inspector under any of these regulationsor against any order passed under regulation 203 shall lie, within twenty days of the receipt ofthe order by the appellant, to the Committee constituted under section 12 of the Act.

(2) Every order of the Chief Inspector, against which an appeal is preferred under subregulation(1) shall be complied with, pending the receipt at the mine of the decision of theCommittee:

Provided that the Committee may, on an application by the appellant, suspend theoperation of the order appealed against, pending the disposal of the appeal.

Recommended Noise Standards

Based on the ILO Code of Practice the following standards and guidelines are recommended.

1) **Warning** limit value of **85 dB (A).**
2) The **danger limit** value shall be **90 dB (A)**
3) With appropriate ear protection, an area in which the noise level is 115 dB (A) or more.
4) PPE shall be worn, if there are single isolated outbursts of noise which can go above 130 dB (A) Impulse or 120 dB (A) 'Fast'.
5) **No worker** shall be allowed to enter an area where the noise level exceeds **140dB (A).**

Extra Shots (Cir. Tech 18/1975)

Equivalent Sound Level at a place

To add two or more noise levels, if the difference between the highest and next highest noise level is:

0–1 dB then add 3 dB to the higher level to give the total noise level
2–3 dB then add 2 dB to the higher level to give the total noise level
4–9 dB then add 1 dB to the higher level to give the total noise level
10 dB and over, then the noise level is unchanged (i.e. the higher level is the total level)
For example, 60 dB plus 60 dB equals 63 dB.

MULTIPLE CHOICE QUESTIONS

Miscellaneous

1. What type of fence is to be erected at the top of working quarry ?
   a) S3
   b) S2
   c) U1
   d) G1
2. What type of fence is to be erected at the top of working shaft?
   a) S3
   b) S2
   c) U1
   d) G1
3. Owner , agent or manager shall provide protective footwear to worker at interval not exceeding ___________.
   a) 3 month
   b) Six month
   c) 1 year
   d) 3 year
4. Owner, agent or manager shall provide protective helmet to worker at interval not exceeding ___________.
   a) 3 month
   b) Six month
   c) 1 year
   d) 3 year
5. There are three sound sources at a place in a mine having intensity of 60 dB(A) each. What will be the equivalent sound level at that point?
   a) 180 dB(A)
   b) 60dB(A)
   c) 65dB(A)
   d) 66dB(A)
6. There are three sound sources at a place in a mine having intensity of 61 dB(A), 62 dB(A), 63dB(A) . What will be the equivalent sound level at that point?
   a) 67dB(A)
   b) 62dB(A)
   c) 186dB(A)
   d) 70dB(A)
7. Functional ability test of SCSR shall be carried out at every _________
   a) 3 months

   b) Six month
   c) 1 year
   d) 3 year
8. Safe heaven is a place in a belowground mine where __________ is kept.
   a) Explosive
   b) SCSR
   c) Safety lamp
   d) Fire extinguisher
9. In a mine where travel time is more than 30 minutes , shall have SCSR of rate duration______.
   a) 30 minutes
   b) 90 minute
   c) 2 hour
   d) 1 hour
10. No worker should be allowed to work in a area where the noise level exceeds_____.
    a) 90 dB(A)
    b) 120 dB(A)
    c) 130 dB(A)
    d) 140dB(A)

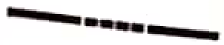
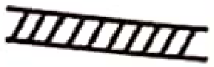
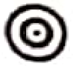
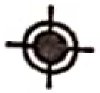
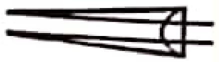
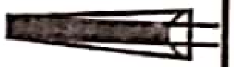
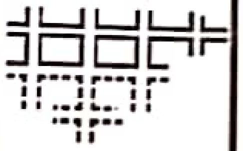
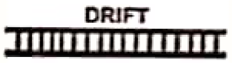
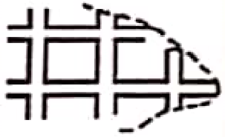
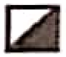
Answers

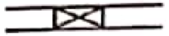
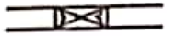
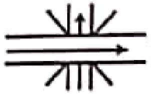
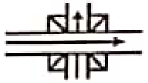
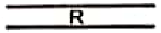
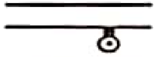
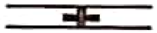
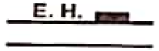
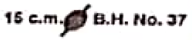
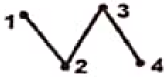
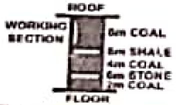
1.a 2.d 3.b 4.d 5.c 6.a 7.c 8.b 9.d 10.d

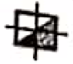
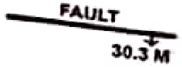
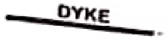
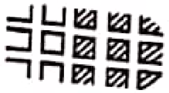
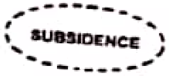
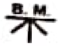
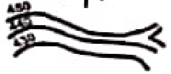
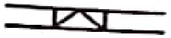
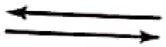
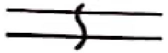
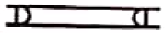
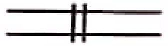
Forms And Their Description

Coal Mines Regulations, 2017	Name of the Form	Subject
Regulation3	Form1-A	Notice of opening
Regulation6	Form1-B	Notice of reopening
Regulation5	Form1-C	Notice of closure, abandonment
Regulation5	Form1-D	Notice of discontinuance
Regulation7	Form2-A	Notice of change in name of mine
Regulation7	Form2-B	Notice of change in the ownership of a mine
Regulation7	Form2-C	Notice of change in the address of the Owner, agent or manager
Regulation7	Form2-D	Notice of appointment of agent, manager, etc
Regulation7	Form2-E	Notice of termination of agent, manager, etc.
Regulation4	Form3	Annual returns
Regulation8	Form4-A	Notice of Accident/Dangerous Occurrence
Regulation8	Form4-B	Particulars of deceased / injured person(s) (to be submitted within 7 days of occurrence)
Regulation8	Form4-C	Particulars of injured person(s) returning to duty
Regulation117	Form 6	Pointing out of contraventions during Inspections
Regulation 28	Form 7	Manager's charge report
Regulation 9	Form 5	Notice of disease notified under section 25 of the Mines Act

Schedule II

NAME	SYMBOL	REMARK
BOUNDARY OF LEASE HOLD		In Red
UNDERGROUND COAL BARRIER		In Green
SHAFT		
ABANDONED SHAFT		
INCLINE		
ABANDONED INCLINE		
PILLARS AND GALLERIES		Workings shown by Dotted lines are not surveyed and their extent is not correctly known
DRIFT		In Burnt Sienna showing gradient in Black
QUARTERLY SURVEY LINE		
STAPLE SHAFT		In Red should state distance up and down to all insets

FIRE DAM, SEAL OR STOPPING		In Red
EXPLOSION PROOF STOPPING		In Red
AIR CROSSING		
EXPLOSION PROOF AIR CROSSING		
REGULATOR		In Red
AUXILIARY FAN		In Red
TELEPHONE		In Red
UNDERGOUND FIRST-AID STATION		Thick cross in Red
ENGINE HOUSE OR ROOM		
BORE HOLE	 15 c.m. B.H. No. 37	Should show serial number & diameter
SURVEY LINES & STATIONS		In Red
SECTION OF SEAM	 ROOF WORKING SECTION 6m COAL 5m SHALE 4m COAL 6m STONE 2m COAL FLOOR	

ABANDONED STAPLE SHAFT		In Red
FAULT		In Red showing the amount and direction of throw
DYKE OR OTHER INTRUSION		In Green
GOAF		
SUBSIDENCE	 SUBSIDENCE	In Red
BENCH MARK		
SURFACE CONTOUR		In Burnt Sienna
UNDERGROUND SPOT LEVEL	+ 104.94	In Blue
WATER DAM		In Red
DIRECTION OF AIR CURRENT		Intake in Blue Return Red
BRATTICE		In Red
DOORS		In Red
BRICK/STONE OR CONCRETE VENTILATION STOPPING		In Red

The Mines Act , 1952

3.(1) Act not apply in certain cases – The provisions of this Act, except those containedin sections 7,8,9, 40,45 and 46 shall not apply to –

(b) any mine or part thereof in which excavation is being made for prospecting purposesonly and not for the purpose of obtaining minerals for use or sale.

Provided that –

(i)not more than twenty persons are employed on any one day

(ii)the depth of the excavation measured from its highest to its lowest point **nowhere exceeds 6 m** or, in the case of an excavation **for coal 15 m**: and

(iii) no part of such excavation extends **below superjacent ground**; or

(b) any mine engaged in the extraction of kankar, murrum laterite, boulder, gravel, shingle, ordinary sand (excluding moulding sand, glass sand and other mineral sands), ordinary clay (excluding kaolin, china clay, white clay or fire clay), building stone, slate, road metal, earthy fullers earth, marl chalk and lime stone.

Provided that –

(i) the working do not extend below superjacent ground: or

(ii)where it is an open cast working –

(a)the depth of the excavation measured from its highest to its lowest point nowhere exceeds 6m;

(b)the number of persons employed on any one day does not exceed 50; and

(c)explosives are not used in connection with the excavation.

INSPECTORS AND CERTIFYING SURGEONS

5. Chief Inspector and Inspector –The Central Government may, by notification in theofficial Gazette, appoint such a person as possesses the prescribed qualifications to beChief Inspector of mines for all the territories to which this Act extends and such personsas possess the prescribed qualifications to be Inspectors of Mines subordinate to theChief Inspector.

(2) No person shall be appointed to be Chief Inspector or an Inspector, or having beenappointed shall continue to hold such office, who is or becomes directly or indirectlyinterested in any mine or mining rights in India.

(3) The District Magistrate may exercise the powers and perform the duties of an Inspector subject to the orders of the Central Government:

But he shall not be deemed to empower a DistrictMagistrate to exercise any of the Powers conferred by **section 22** or section **22A** orsection **61.**

6. Functions of Inspectors –(1) The Chief Inspector may, with the approval of the CentralGovernment and subject to such restrictions or conditions as he may think fit to impose, by order in writing: authorise any Inspector named or any class of Inspectors specified inthe order to exercise such of the powers of the Chief Inspector under this Act (other thanthose relating to appeals) as he may specify.

(2) The Chief Inspector may by order in writing, prohibit or restrict the exercise by anyInspbctor named or any class of Inspectors specified in the order of any power conferredon Inspectors under this Act.

(3) Subject to the other provisions contained in this section, the Chief Inspector shall declare the local area or areas within which or the group or class of mines with respect towhich Inspector shall exercise their respective powers.

7. Powers of Inspectors of Mines –Inspector of mines may make such examination and inquiry as he thinks fit, in order to ascertain whether the provisions of this Act and of the regulations, rules and bye-laws and of any orders madethere under are observed in the case of any mine. He may seize as well as to file a complaint for any offence committed under under the provision of the act.

8. Powers of special officers to enter, measure, etc. –

Any person in the service of Government duly authorised in this behalf by a special orderin writing of the Chief Inspector or of an Inspector may, for the purpose of surveyingleveling or measuring any mine; or any output therefrom after giving not **less than 3 days' notice** to the manager of such mine, enter the mine and may survey, level ormeasure, the mine or any part thereof or any output therefrom after giving not less thanthree days' notice to the manager of such mine, enter the mine and may survey, level ormeasure, the mine or any part thereof or any output therefrom at any time by day ornight:

9A. Facilities to be provided for occupational health survey-

(i) The Chief Inspector or an Inspector or other officer authorised by him in writing in thisbehalf, may at any time during the normal working hours of the mine or at any time byday or night as may be necessary undertake safety and occupational health survey in amine after giving notice in writing to the manager of the mines and the owner, agent ormanager of the mine shall afford all necessary facilities to such Inspector or officer.

(2) Every person employed in a mine who is chosen for examination shall present himself and shall furnish all informationregarding his work and health in connection with the said survey.

(3) The time spent by any person employed in a mine who is chosen for examination inthe safety and occupational health survey, shall be counted towards his working time, sohowever that any overtime shall be paid at the ordinary rate of wages.

(4) Any person who, on examination is found medically unfit todischarge the duty which he was discharging in a mine immediately before suchpresentation shall be entitled to undergo medical treatment at the cost of the owner,agent and manager with full wages during the period of such treatment.

(5) If, after the medical treatment also the person is declaredmedically unfit to discharge the duty which he was discharging in a mine immediatelybefore absenting himself from the said examination and such unfitness is directly ascribable to his employment in the mine before such presentation, the owner, agentand manager shall provide such person with an alternative employment in the mine forwhich he is medically fit :

Provided that where no such alternative employment is immediately available,such person shall be paid by the owner, agent and manager disability allowanceas specified in MR-82A(1).

> **MR 82A Disability allowance and compensation for occupational diseases** .- (1) The disability allowance payable shall be at the rate of 50 % of the monthly wages that he was in receipt of immediately before presenting himself for the medical examination.

10. Secrecy information obtained-All information acquired by the Chief Inspector or an inspector or a special officer during inspection of mine must be kept confidential and must not be disclosed to any person or authority unless such disclosure is deemed necessary to ensure the health, safety or welfare of any person in the same mine or in an adjoining mine.Such information may be given to

(a) any court;

(b) a Committee or court of inquiry constituted or appointed under section 12 or section24, as the case may be:

(c) an official supervisor or the owner, agent or manager of the concerned mine:

(d) a Commissioner for workmen's compensation appointed under the Workmen's Compensation Act, 1923;

(e) the Controller Indian Bureau of Mines.

(f) any registered or recognised trade union;

(g) such other officer, authority and organisation as may be specified in this behalf by theCentral Government

If the Chief Inspector, or an Inspector or any other person discloses any such information as aforesaidwithout the consent of the Central Government, he shall be punishable withimprisonment for a term which may **extend to one year**, or with fine, or with both.

11. Certifying Surgeons :-

(1) The Central Government may appoint qualified medical practitioners to be certifyingsurgeons for the purpose of this Act.

(4) The certifying surgeon shall carry out such duties as may be prescribed in connectionwith -

(b) the examination of persons engaged in a mine in such dangerous occupations or processes as may be prescribed:

(c) the exercise of such medical supervision as may be prescribed for any mine or classor description of mines where-

(i) cases of illness have occurred which it is reasonable to believe are due to the natureof any process carried on or other conditions of work prevailing in the mine.

To medically examine and prepare the age and fitness certificates in respect of(from Section- 43) :

a) Such mine workers who in the opinion of an inspector are not adults, and

b) Such apprentices or trainees who in the opinion of an inspector are either below 16 years of age or are not fit to work in a mine.

COMMITTEES

12. Committees :-

(1) The Central Government shall, for the purposes of this Act, constitute a Committee consisting of -

(a) a person in the service of the Government, not being the Chief Inspector or an Inspector, appointed by the Central Government to as Chairman:

(b) the Chief Inspector of mines;

(c) two persons to represent the interests of miners appointed by the Central Government;(at least one of the person shall represent the interests of workers in coal mines)

(d) two persons to represent the interests of owners of mines appointed by the Central Government;(at least one of the person shall represent the interests of owners of coal mines).

(e) two qualified mining engineers not directly employed in the mining industry, appointed by Central Government.

> From Mine Rules
>
> The term of office of the members referred to in clause (c), (d) and (e) shall be three years.
>
> 7. Resignation.- (1) A member other than the Chairman may resign by giving his resignation letter to the Chairman .
>
> (2) The Chairman may resign by giving his resignation letter to the Central Government.
>
> 8. Absence from India - (1) Before leaveing India member shall intimate to the Chairman.
>
> (b) he shall tender his registration if he intends to be absent from India for a period longer than 6 months
>
> (2) If any member leaves India without intimating the Chairman, he shall be deemed to have resigned with effect from the date of his departure from India.
>
> 12. Notice of meetings - (1) The Secretary to the Committee shall give at least fourteen days' notice to every member of the Committee present in India of the time and place fixed for each meeting and shall send to every such member agenda of business to be disposed off at that meeting, not less than seven days before the meeting :

Provided that when an emergent meeting is called, at least two days' clear notice shall be given.

13. Presiding at meeting- The Chairman shall preside at every meeting of the (meeting at which he is present. If the Chairman is absent from any meeting, the members present shall elect one of them to preside over the meeting and the member so elected shall at that meeting exercise all the powers of the Chairman.

14. Quorum – No business shall be transacted at a meeting of the Committee unless **at least four members** including the Chairman are present;

Provided that at any meeting in which less than four members including the Chairman are present, the Chairman may adjourn the meeting to a date not less than fourteen days later and inform the members present and notify other members that he proposes to dispose off the business at the adjourned meeting irrespective of the quorum, and it shall thereupon be lawful to dispose off the business at such adjourned meeting irrespective of the number of members attending.

13. Functions of the committee –

(a) **consider proposal** for making rules and regulations under this Act and make appropriate recommendations to the Central Government;

(b) **enquiry into such accidents** or other matters referred to it by the Central Government from time to time and make reports thereon; and

(c) **hear and decide any appeals** or objections against notices or orders under this Act, regulations, rules or bye-laws

(2) The Chief Inspector shall not take part in the proceedings of the Committee with respect to any appeal or objection against an order on notice made or issued by him or act in relation to any matter pertaining to such appeal or objection as a member of the Committee.

14. Powers, etc. of the Committees –

(1)May exercise the **powers of an Inspector** under this Act

(2) May exercise the powers that are vested in a **court** under the Code of Civil Procedure, 1908 when trying a suit in respect of the following matters, namely :–

(a) discovery and inspections;

(b) enforcing the attendance of any person and examining him on oath;

(c) compelling the production of documents; and

(d) such other matters as may be prescribed.

15. Recovery of expenses –

The Central Government may direct that the expenses of any inquiry conducted by a committee shall be borne in whole or in part by the owner oragent of the mine concerned.

MINING OPERATIONS AND MANAGEMENT OF MINES

17. (1) Managers-Every mine shall be under a solemanager and the owner or agent of everymine shall appoint a person having such qualifications to be the manager:

Provided that the owner or agent may appoint himself as manager if he possesses theprescribed qualifications.

(2) Manager shall be responsible for the overall management, control, supervisionand direction of the mine.

(3) Except in case of an emergency, the owner or agent of a mine or anyone on his behalf shall not give otherwise than through the manager, instructions affecting the fulfilment of his statutory duties, to a persons, employed in a mine, who is responsible tothe manager.

18. Duties and responsibilities of owners, agents and managers :-

(1) The owner and agent of every mine shall each be responsible for making financialand other provisions.

(ii) It is the responsibility of owner, agent or person appointed therefore in respect of matter connected with the crèche, pit-head bath and canteen.

(iii) the owner, agent and manager of every mine shall each be responsible to see that all operations carried onin connection with the mine are conducted in accordance with the provisions of this Act and of the regulations, rules, bye-laws and orders made thereunder.

(iv) In the event of any contravention by any person whosoever of any of the provisions, not only that person but also the concerned supervisor and the owner, the agent and the manager are also deemed to be guilty. Although the contravention may be caused by someone else, the owner, agent and manager are held vicariously liable. It is for them to prove that they are not guilty by establishing that they had taken reasonable means and used due diligence to secure compliance with the provisions.

PROVISION AS TO HEALTH AND SAFETY

19. Drinking water – Drinking water place shall not be situated within 6m of any washing place, urinal or latrine, unless a shorter distances is approved in writing by the Chief Inspector.

From Mine rule

30. Quantity of drinking water - (1) The quantity of drinking water to be provided in a mine or any part thereof shall be on a scale of at least two litres for every person employed at any one time.

Quantity of water provided when the wet bulb temperature exceeds 30°C be 3 litres per person.

(Cir. Welfare 1/1978)

(2) Where 100 persons or more are employed, either above ground or in opencast workings, at any one time, an Inspector may by order in writing

require the drinking water to be effectively cooled by mechanical or other means available.

21. Medical appliance - In every mine wherein **more than one 150 persons** are employed thereshall be provided and maintained a **first-aid room.**

22. Powers of Inspectors when causes of danger not expressly provided against exist orwhen employment of persons is dangerous:

(1)If, in respect of any matter for which **no express provision** is made**[such as cases of**

i. defective machinery or electrical installation;

ii. the extraction or reduction of pillars or blocks of minerals in any mine or part thereof, which is likely to cause the crushing of pillars or blocks of minerals or the premature collapse of any part of the working or otherwise endanger the mine or the life or safety of persons employed therein or

iii.if, in hisopinion, adequate provision against the outbreak of fire or flooding has not been made byproviding for the sealing off and isolation of the part of the mine in which such operationis contemplated and for restricting the area that might be affected by fire or flooding]

by or under this Act,it appears to the Chief Inspector or an Inspector that any mine or part thereof or anymatter, thing or practice in or connected with the mine, or with the control, supervision,management or defective so as to threaten, or tend to, the bodily injury of any person, hemay give notice, in writing thereof to the owner, agent or manager of the mine and shallstate in the notice the particulars in respect of which he considers the mine or part thereofor the matter, thing or practice to be dangerous or defective and require the same to beremedied within such time and in such manner as he may specify in the notice.

(1A) Where the owner, agent or manager of amine fails to comply with the terms of notice given under sub-section (1) within the period specified therein, the Chief Inspectoror the Inspector, may prohibit the employment inor about the mine or any part thereof any person whose employment is not in his opinionreasonably necessary for securing compliance with the terms of the notice.

Every person whose employment is prohibited under this section or 22A shall be paid full wages for the relevant period or be provided with alternative employment. An appeal against a notice or order of an Inspector shall lie with the **CI within 10** days and an appeal against notice or order of the CI shall lie with the Central **Government within 20 days**. The central government will ordinarily refer the objection to a **committee within 2 months** from the date of receipt of the objection. The notice of order has to be complied with its disposal by the committee.

22A Power to prohibit employment in certain cases:1)Where in respect of any matter relating to safety for which express provision is madeby or under this Act, the owner, agent or manager of mine fails to comply with suchprovisions, the Chief Inspector may give notice in writing requiring some to be compliedwith within such time as he, may specify in the notice or within such extended period oftime as he may, from time to time, specify thereafter.

(2)Where the owner, agent or manager fails to comply with the terms of a notice within the period specified in such notice or, as the case may be,within the extended period of time specified under that sub-section, the Chief Inspectormay, by order in writing, prohibit the employment in or about the mine or any part thereof of any person whose employment is not, in his opinion reasonably necessary for securingcompliance with the terms of the notice.

(3)Every person whose employment is prohibited , shall be entitledto payment of full wages for the period for which he would have been, but for theprohibition, in employment, and the owner, agent or manager shall be liable for paymentof such full wages of that person.

Provided that the owner, agent or manager may, instead of paying such full wages,provide such person with an alternative employment at the same wages which suchperson was receiving in the employment.

(4) The provisions of sub-section (5), (6) and (7) of section 22 shall apply in relation to anotice issued under sub-section (1) or an order made under sub-section(2) of this sectionas they apply in relation to a notice under sub-section (1) or an order under sub-section (1A) of that section.

24. Power of Government to appoint court of enquiry in cases of accidents:-

(1) The Central Government may appoint a **competent personand** may also appoint one or **more persons possessing legal** or special knowledge to act asassessor or assessors in holding the inquiry in to accident.

(2) The person appointed to hold such an inquiry

a) may exercise the powers of an Inspector under this Act

b) may exercise the powers that are vested in a court under the Code of Civil procedure 1908 (Act V of 1908)

HOURS AND LIMITATION OF EMPLOYMENT

22. Weekly day of rest :- No person shall be allowed to work in a mine for more than six days in any one week.

23. Compensatory days of rest :- If a Person is deprived of the weekly days of rest, he should be given a compensatory day of rest within the same month or within the next two months.

30. Hours of work above ground

(1) No adult employed above ground in a mine shall be required or allowed to work formore than **forty-eight hours** in any week or for **more than nine hours** in any day.

(2) The periods or work of any such adult shall be so arranged that along with his intervalfor rest, they shall not in any day spread over more than twelve hours, and

that he shall not work for more than five hours continuously before he has had an interval for rest of at least half an hour:

Provided that the Chief Inspector may permit the spread over to extend over a period not exceeding fourteen hours in any day.

(3) Persons belonging to two or more shifts shall not be allowed to do work of the samekind above ground as the same time.

31. Hours of work below grounds:-

(1) No person employed below ground in a mine shall be allowed to work for more than forty-eight hours in any week or for more than eight hours in any day.

(2) No work shall be carried on below ground in any mine except by a system of Shifts which shall be
so arranged that the period of work for each shifts is not spread-over more than the daily maximum hours stipulated in sub-section (1).

33. Extra wages for overtime:- (1) Where in a mine a person works above ground for more than nine hours in any day or works below ground for more than eight hours in any day or works for more than forty-eight hours in any week. Whether above ground or below ground, he shall in respect of such overtime work be entitled to wages at the rate of twice his ordinary rate of wages.

In case of piece rated employee, the time rate shall be equivalent to the average of his full time earnings (excluding any overtime) during the preceding week.

34. Prohibition of employment of certain persons :

No person shall be required or allowed to work in a mine if he has already been working in any other mine within the **preceding twelve hours.**

35. Limitation of daily hours of work including over-time work:

No person employed in a mine shall be required or allowed to work in the mine for more than tenhours in any day inclusive of overtime except in case of emergency.

36. Notices regarding hours of work: (1) The manager of every mine shall cause to be posted outside the office of the mine a notice of working hours.

37. Supervising staff :- The provisions regarding weekly day of rest, hours of work above and belowground, prohibition of employment of a person who has already worked in another mine during the preceding 12 hours and working only in accordance with the notice of hours of work will not apply to person holding positions of supervision , management or employed in a confidential position.

38. Exemption from provisions regarding employment:- (1) This section empowers the manager to permit employment of persons in contravention of the restrictions and limitations on employment aforesaid (that is relating to weekly day of rest, hours of work above and belowground, prohibition of employment of a person who has already worked in another mine during the preceding 12 hours and working only in accordance with the notice of hours of work) under the following circumstances :

a) an emergency
b) an accident
c) an act of God
d) any urgent work to be done to machinery, plant or equipment.

However , such employment cannot be permitted in contravention of orders under section 22 or 22A and can be permitted only to the extent allowed by rules made under section 39.

(2) Manager has to maintain a record of such employment and a report has to be sent to the Chief Inspector.

38. Exemption from provisions regarding employment:- The Central Government may make rules providing for the exemption from the provisions of sections 28, 30, 31, 34 or sub-section (5) of section 36 in case of –

a) an emergency involving serious risk to the safety of the mine or of the persons employed therein.
b) an accident, actual or apprehended.
c) the persons engaged in work of a preparatory or complementary nature, which must necessarily be carried on for the purpose of avoiding serious interference with the ordinary working of the mine.
d) urgent repairs.
e) any work, which must be carried on continuously for technical reasons.

40. Employment of persons below eighteen years of age :- No person below eighteen years of age shall be allowed to work in any mine or part thereof. However Apprentices and other trainees, not below sixteen years of age, may be allowed to work, after taking prior approval of the Chief Inspector or an Inspector , under proper supervision, in a mine by the manager.

45. Prohibition of the presence of persons below eighteen years of age in a mine :- No personbelow eighteen years of age shall be allowed to be present in any part of a mine above ground where any operation connected with or incidental to any mining operation is being carried on.

46. Employment of women :-

As per S.O. 506(E).—2/01/2019

(a) in the case of women employed in any mine above ground,—

(i) Now owner may deploy women for 24 hours in the mine above ground including opencast workings.

(ii)But for time period 7 pm to 6 am deployment of women shall be after obtaining the written consent of the concerned woman employee.

(iii) the women so deployed shall be provided with adequate facilities and safeguards regardingoccupational safety, security and health;
(iv) the deployment of women shall be subject to the framing and implementation of StandardOperating procedures on the basis of the guidelines issued in this regard by the Chief Inspectorof Mines from time to time;
(v) the deployment of women shall be in a group of not less than three in a shift.
(b) in the case of women employed in any mine below ground,—
(i) the owner of a mine may deploy women between the hours of 6 am and 7pm in technical,supervisory and managerial-work where continuous presence may not be required.
(ii) the deployment of women shall be after obtaining the written consent of the concerned womanemployee;
(iii) the women so deployed shall be provided with adequate facilities and safeguards regardingoccupational safety, security and health;
(iv) the deployment of women shall be subject to the framing and implementation of StandardOperating Procedures on the basis of the guidelines issued in this regard by the Chief Inspectorof Mines from time to time;
(v) the deployment of women shall be in a group of not less than three.

LEAVE WITH WAGES

51. Calendar year defined :For the purpose of this Chapter a calendar year shall mean the period of twelve monthsbeginning with the first day of January in any year.

52. Annual leave wages :-
(1) Every person employed in a mine who has completed a calendar year's service therein shall be allowed, during the subsequent calendar year leave with wages, calculated –
(a) in the case of a person employed below ground, at the rate of one day for every 15 days of work performed by him, and in any other case, at the rate of one day for every 20 days of work performed by him.
(2) A calendar year's service shall be deemed to havecompleted:-
(a) in the case of a person employed below ground in a mine, if he has during the calendar year put in not less than one hundred and ninety attendances at the mine; and
(b) in the case of any other person, if he has during the calendar year put in not less than two hundred and forty attendances at the mine.

In the case of a female employee, **maternity leave** for any number of days **not exceeding 12 weeks**

(3) A person whose service commences otherwise than on the first day of January shall be entitled to leave with wages in the subsequent calendar year at the rates specified in sub-section(1), if –

(a) in the case of a person employed below ground in a mine, he has put in attendances for not less than one half of the total number of days during the remainder of the calendar year: and
(b) in any other case, he has put in attendances for not less than two-thirds of the total number of days during the remainder of the calendar year.
(4) Any leave not taken by a person to which he is entitled in any one calendar year under sub-section(1) or sub-section(3) shall be added to the leave to be allowed to him under sub-section(1) during the succeeding calendar year.

Provided that the total number of days of leave which may be accumulated by any such person shall not at any one time exceed thirty days in all.
(5) Any such person may apply in writing to the manager of the mine **not less than fifteen days** before the day on which he wishes his leave to begin.

Provided that the number of times in which leave may be taken during any one calendar year shall **not exceed three.**
(7) If a person employed in a mine wants to avail himself of the leave with wages due to him to cover a period of illness he shall be granted such leave even if the application for leave is not made within the time specified in sub-section(5).
(8) If the employment of a person employed in a mine is terminated by the owner, agent or manager of the mine before he has taken the entire leave to which he is entitled up to the day of termination of his employment, or if such person having applied for and having not been granted such leave, quits his employment before he has taken the leave, the owner, agent or manager of the mine shall pay him the amountpayable under section 53 in respect of the leave not taken and such payment shall be made where the employment of the person is terminated by the owner, agent or manager, before the expiry of the second working day after such termination, and where a person himself quits his employment, on or before the next pay day.
(10) Where the person employed in a mine is discharged or dismissed from service or quits his employment or is superannuated or dies while in service, he or his heirs or wages in lieu of leave due to him calculated at the rate specified in sub-section (1), if-
(a) in the case of a person employed below ground in a mine, he has put in attendance for not less than one-half of the total number of days from the date of his employment to the date of his discharge or dismissal or quitting of employment or superannuation or death, and
(b) in any other case, he has put in attendance for not less than two thirds of the total number of days from the date of his employment to the date of his discharge or dismissal or quitting of employment of superannuation or death, and payment of such wages shall be made by the owner, agent or manager of the mine at the rate specified in section 53, where the person isdischarged or dismissed from service or

quits employment or issuperannuated, before the expiry of the second working day after suchdischarge dismissal, quitting of employment or superannuation, as the casemay be and where the person employed dies while in service within a period of two months of his death.

53. Wages during leave period :-For the leave allowed to a person employed in a mine under section 52, he shall be paidat a rate equal to the daily average of his total full-time earnings for the days on which hewas employed during the month immediately preceeding his leave, exclusive of anyovertime wages and bonus but inclusive of any dearness allowance and compensation incash including such compensation, if any accruing through the free issue of foodgrainsand other articles as persons employed in the mine may, for the time being, be entitledto:

Provided that if no such average earning are available, then the average shall becomputed on the basis of the daily average of the total full time earnings of all personssimilarly employed for the same months.

54. Payment in advance in certain cases:- Any person employed in a mine who has been allowed leave for not less than four days shall before his leave begins be paid the wages due for the period of the leave allowed.

REGULATIONS, RULES AND BYE-LAWS

57. Power of Central Government to make regulations:-
The Central Government may, by notification in the official Gazette make regulations consistent with this Act for all or any of the following purposes, namely:

(a) for prescribing the qualifications required for appointment as Chief Inspector or Inspector;

(b) for prescribing and regulating the duties and powers of the Chief Inspector and of Inspectors in regard to the inspection of mines under this Act;

(c) for prescribing the duties of owners, agents and managers of mines and persons acting under them and for prescribing the qualifications including age) of agents and managers of mines and of persons acting under them.

(d) for requiring facilities to be provided for enabling managers of mines and other persons acting under them to efficiently discharge their duties.

(e) for regulating the manager of ascertaining, by examination or otherwise, the qualification of managers of mines and persons acting under them and the granting and renewal of certificates of competency.

(f) for fixing the fees, if any, to be paid in respect of such examinations and of the grant and renewal of such certificates.

(g) For determining the circumstances in which and the conditions in respect to which it shall be lawful for more mines than one to be under a single manager, or for any mine or mines to be under a manager not having the prescribed qualifications.

(h) For providing for inquiries to be made under this including any inquiry relating to misconduct or incompetence on the part of any person holding a certificate under this Act and for the suspension or cancellation of any such certificate and for providing where ever necessary, that the person appointed to hold an inquiry shall have all the powers of a civil court under the Code of Civil Procedure 1908, (V of 1908) for the purpose of enforcing the attendance of witnesses and compelling the production of documents and material objects.

(i) For regulating, subject to the provisions of the Indian Explosives Act, 1884, (IV of 1884) and of any rules made thereunder, the strong, conveyance and use of explosive,

(j) For prohibiting, restricting or regulating the employment of women in mines or in any class of mines of on particular kind of labour which are attended by danger to the life, safety, or health of such persons and for limiting the weight of any single load that may be carried by any such person;

(k) For providing for the safety of the persons employed in a mine, their means of entrance thereinto and exit therefrom the number of shafts or outlets to be furnished; and the fencing of shafts, pits, outlets, pathway and subsidences;

(l) For prohibiting the employment in a mine either as manager or in any other specified capacity of any person except persons paid by the owner of the mine and directly answerable to the owner or manager of the mine;

(m) For providing for the safety of the roads and working places in mines, including the sitting; maintenance and extraction or reduction of pillars or blocks of minerals and the maintenance of sufficient barriers between mine and mine;

(n) For the inspection of workings and sealed off fire-areas in a mine, and for the restriction of workings in the vicinity of the sea or any lake or river or any other body of surface water, whether natural or artificial, or of any public road or building and for requiring due precaution to be taken against the irruption or inrush of water or other matter into, outbreak of fire in or premature collapse of any workings;

(o) For providing for the ventilation of mines and the action to be taken in respect of dust fire, and inflammable and noxious gases, including precautions against spontaneous combustion, under ground fire and coal dust;

(p) For regulating subject to the provisions of the Indian Electricity Act, 1910(X of 1910) and of any rules made thereunder, the generation, storage, transformation transmission and use of electricity in mines and for providing for the care and the regulation of the use of all electrical apparatus and electrical cables in mines and of all other machinery and plant therein.

(q) For regulating the use of machinery in mines, for providing for the safety of persons employed on or near such machinery and on haulage roads and for restricting the use of certain classes of locomotives underground;

(r) For providing for proper lighting of mines and regulating the use of safety lamps therein and for the search of persons entering a mine in which safety lamps are in use;

(s) For providing against explosions or ignitions of inflammable gas or dust or irruption or accumulations of water in mines and against danger arising therefrom and for prohibiting restricting or regulating the extraction of minerals in circumstances likely to result in the premature collapse of workings or to result in or to aggravate collapse of workings or irruption of water or ignitions in mines;

(t) For prescribing under clause(g) of sub-section(1) of section 2, the types of accidents and for prescribing the notices of accidents and dangerous occurrences and the notices reports and returns of mineral output; persons employed and other matters provided for by regulations to be furnished by owners, agents and managers of mines, and for prescribing the forms of such notices, returns and reports, the persons and authorities to whom they are to be furnished the particulars to be contained in them and the time within which they are to be submitted;

(u) For requiring owners, agents and managers of mines to have fixed boundaries for the mine, for prescribing the plans and sections and field notes connected therewith to be kept by them and the manager and places in which such plans, section and field notes are to be kept for purposes of record for the submission of copies thereof to the Chief Inspector; and for requiring making of fresh surveys and plans by them and in the event of noncompliance,

for having the survey made and plans prepared through and other agency and for the recovery of expenses thereof in the same manner as an arrear of land revenue:

(v) For regulating the procedure on the occurrence of accidents or accidental explosions or ignitions in or about mines for dealing effectively with the situation.

(w) For prescribing the form of, and the particulars to be contained in the notice to be given by the owner, agent or manager of a mine under section 16;

(x) For prescribing the notice to be given by the owner, agent or manager of mining before mining operations are commenced at or extended to any point within forty-five metres of any railway subject to the provisions of the Indian

Railways Act, 1890, (IX of 1890) of any public roads or other works, as the case may be which are maintained by the Government or any local authority.

(y) For the protection from injury, in respect of any mine when the workings are discontinued, property vested in the Government or any local authority or railway company as defined in the Indian Railways Act, 1890.

(yy) for requiring protective works to be constructed by the owner, agent or manager or a mine before the mine is closed, and in the event of noncompliance, for getting such works executed by any other agency, and for recovering the expenses, thereof from such owner in the same manner as an arrear of land revenue;

(z) for providing for the appointment of Courts of Inquiry under quarry, incline, shaft pit or outlet, whether the same is being worked or not or any dangerous or prohibited area, subsidence haulage, tramline or pathway, where such fencing is necessary for the protection of the public; and

(zz) any other matter which has to be or may be prescribed.

"public road" means a road maintained for public use and under the jurisdiction of any Government or local authority

58. Power of Central Government to make rules –

The Central Government may, by notification in the official Gazette, make rule consistentwith this Act for all or any of the following purposes, namely -

(a) for providing the term of office and other conditions of service of and the manner of filling vacancies among, the members of a Committee and for regulating the procedure to be followed by a Committee for transacting its business."

(b) For prescribing the form of the register referred to in sub-section (3) of section 23;

(c) For providing for the appointment of Courts of Inquiry under section 24, for regulating the procedure and powers of such Courts for the payment of travelling allowance to the members, and for the recovery of the expenses of such courts including any other expenses connected with the inquiry in the same manner as an area of land revenue from the manager, owner or agent of the mine concerned;

(cc) for providing the inspection of mines to be carried out on behalf of the persons employed therein by a technical expert (not less than an overman in status) the facilities therefore, the frequency at which and the manner in which such inspections are to be carried out and the manner in which reports of such inspections are to be made.

(d) for requiring the maintenance of the mines wherein any women employed or were employed on any day of the preceding twelve months of suitable rooms to be reserved for the use of children under the age of six years belonging to such women, and for prescribing, either generally or with particular reference to the number of women employed in the mine, the number of standards of such rooms, and the nature and extent of the amenities to be provided and the supervision to be exercised therein;

(e) for requiring the maintenance at or near pitheads of bathing places equipped with shower baths and of locker rooms for the use of men employed in mines and of similar and separate places and rooms for the use of women in mines where women are employed and for prescribing either generally or with particular reference to the numbers of men and women ordinarily employed in a mine, the number and standards of such places and rooms.

(f) For prescribing the standard of sanitation to be maintained and the scale of latrine and urinal accommodation to be provided at mines, the provision to be made for the supply of drinking water.

(ff) for providing for the supply and maintenance of medical appliances and comforts and for prescribing the contents and number of first-aid boxes and cupboards, the training in first-aid work, the size and equipment of first-aid rooms and staff in charge thereof and the arrangements for conveyance of injured persons to hospitals or dispensaries;

(fff)for requiring the imparting of practical instruction to, or the training of, persons employed or to be employed in mines otherwise than in a position of such instruction and training;

(g) for prohibiting the possession or consumption of intoxicating drinks or drugs in a mine and the entry or presence therein of any person in a drunken state;

(h) for prescribing the form of notices required under section 36, and for requiring such notices to be posted also in specified languages;

(i) for defining the person who shall, for the purpose of section 37, be deemed to be persons holding positions of supervision of management employed in a confidential capacity;

(j) for prohibiting the employment in mines of persons or any class of persons who have not been certified by a qualified medical practitioner to have completed their fifteenth year, and for prescribing the manner and the circumstances in which such certificates may be granted and revoked;

(k) for requiring persons employed or seeking employment at mines to submit themselves for medical examination and for prohibiting on medical grounds the employment of any person at a mine either absolutely or in a particular capacity or in particular work;

(l) for prescribing the form of registers required by section 48 and the maintenance and form or registers for the purposes of Chapter VII;

(m) for prescribing abstracts of this Act and of the regulations and rules and the language in which the abstracts and bye-laws shall be posted as required by section 61 and 62;

(n) for requiring notices, returns and reports in connection with any matters dealt with by rules to be furnished by owners; agents and managers of mines and for prescribing the forms of such notices returns and reports, the persons and authorities to whom they are to be furnished, the particulars to be contained in them, and the times within which they are to be submitted;

(o) for requiring the provision and maintenance in mines; wherein more than fifty persons are ordinarily employed, of adequate and suitable shelters for taking food with provisions for drinking water.

(p) For requiring the provision and maintenance in any mine specified in this behalf by the Chief Inspector or Inspector wherein more than two hundred and fifty persons are ordinarily employed of a canteen or canteen for the use of such persons;

(q) For requiring the employment in every mine wherein five hundred or more persons are ordinarily employed of such number of welfare officers as may be specified and for prescribing the qualifications and the terms and conditions of, and the duties to be performed by, such welfare officers;

(r) For requiring the establishment of rescue stations for specified mines or groups of specified mines or for all mines in a specified area and for prescribing how and by whom such stations shall be established;

(s) For providing for the management of rescue stations

(sa)for providing for the standards of physical fitness and other qualifications of the persons constituting rescue brigades;

(sb)prescribing the places of residence of the persons constituting rescue brigades;

(t) for prescribing the position, equipment, control, maintenance and functions of rescue stations;

(u) for providing for the levy and collection of a duty of excise(at) a rate not exceeding twenty five paise per tonne) on coke and coal produced in and despatched from mines specified under clause(r), the creation of a rescue stations fund for such mines, the crediting to such fund of such sums of money as the Central Government may, after due appropriation made by Parliament by law in this behalf, provide from out of the proceeds of such cess credited to the Consolidated Fund of India, the manner in which the money from such fund shall be utilised and the administration of such fund;

(v) for providing for the formation, training composition and duties of rescue brigades and generally for the conduct of rescue work in mines;

(vv) for providing for the constitution of safety Committees for specified mine or groups of specified mines or for all mines in a specified area for promoting safety and for laying down the composition, manner of formation and functions of such safety Committees and, "

(w) generally to provide for any matter not provided for by this Act or the regulations, provision for which is required in order to give effect to this Act.

59. Prior publication of regulations and rules – A draft of regulations or rules proposed to be made shall not be less than three months from the date on which thedraft of the proposed regulations or rules published for general information.

(4) no regulation or rule shall be made unless the draft thereof has been referred to theCommittee.

60. Power to make regulations without previous Publications – Central Government can make temporary regulations without previous publication and without reference to the Committee if he is satisfied that for the prevention of apprehended danger or the speedy remedy of conditions likely to cause danger it is necessary in making such regulations:

Provided that any regulation so made shall be send to the said committee for information and shall not remain in force for more than one year from the making thereof.

61. Bye-Laws

(1)The owner, agent or manager of a mine , either on his own initiative or when asked by the Chief Inspector or an Inspector, shall frame draft by law and submit them to the Chief Inspector.

(2) If any such owner, agent or manager –

(a) falls to submit within two months , or

(b) submits a draft of bye-laws which is not in the opinion of the Chief Inspector or Inspector sufficient, the Chief Inspector or Inspector may –

(i) propose a draft of such bye-laws as appear to him to be sufficient, or

(ii)propose amendment and shall send such draft or bye-laws or draft amendment to the owner agent or manager as the case may be, for consideration.

(3) If the owner, agent or manager and Chief Inspector or Inspector are unable to agree as to the terms of the bye-laws within two months the Chief Inspector or Inspector shall refer the draftbye-laws for settlement to the Committee.

(4) (a)When such draft bye-laws have been agreed to by the owner, agent or manager and the Chief Inspector or Inspector or, which they are unable to agree, have been settled by the Committee constituted under sub-section (1) of section 12, a copy of the draft bye-laws shall be sent by the Chief Inspector or Inspector to the Central Government for approval.

(b)The Central Government may make such modification of the draft bye-laws as it thinks fit.

(c)Before approving the draft bye-laws the Central Government shall publish them suitably for informing the persons affected and set a time of ate least not be less than thirty days withinwhich any objections to the draft bye-laws, may be sent to the Government.

(5)The bye-laws, when so approved by the Central Government shall have effect as ifenacted in this Act.

61 A. Laying of regulations, rules and bye-laws before parliament.
Every regulation ,rule and everybye-law made shall be laid as soon as may be after it is made beforeeach house of parliament, while it is in session, for a total period of thirty days so that members can see them.

CHAPTER – IX
PENALTIES AND PROCEDURE

Punishment	Offence
I : 1 m or F: Rs 200Or both	65. Use of false certificates of fitness granted under section 43

F: Rs 300	63 (ii) refuses to produce any document or preventing any person from being examined.
F: Rs 500	68. Employment of person below 18 years of age
F: Rs 1000	66.Omission to furnish plans, return, notice, report etc.
I : 3 m or F: Rs 500Or both	63(i) obstructing the Chief Inspector and inspector in discharging their duties. 70(i)failing to give notice of any accident or post copy on notice board 70(ii) failing to maintain register of accident and submit report
I : 3 m or F: Rs 1000 Or both	67 Contravention of provisions regarding employment of labour. 72C (c)contravention of law resulting in injury (other than serious bodly injury, loss of life) or danger 73. contravention of any provision of law for which no penalty is prescribed 64 Falsification of records etc. Making false statements or submitting false certificates, plan, return or other record.
I : 3 m or F: Rs 2500Or both	**69 Failure to appoint manager**
I : 6 m or F: Rs 2000Or both	**72A Contravention of provision of certain regulation**
I : 1 yr or F: Rs 3000Or both	72C (b) contravention of law resulting in serious bodily injury
I : 2 yr or F: Rs 5000Or both	72C(a) contravention of law resulting in loss of life 72B contravention of orders under section 22 or 22A
Double the punishment of first contravention	Repeated conviction for the same offence committed again within 2 years of previous conviction.

71. Owner etc. to report to Chief Inspector in certain cases-
Where the owner, agent or manager of a mine, has taken proceeding under this Act against any person employed in a mine in respect of an offence under this Act, he shall within twenty-one days from the date of thejudgement or order of the court report the result thereof to the Chief Inspector.

75. Prosecution of owner, agent or manager - No prosecution shall be instituted against any owner, agent or manager for any offence under this Act except at the instance of the Chief Inspector or of the District Magistrate or of an Inspector authorised in this behalf by general or special order in writing by the Chief Inspector.

77.Exemption of owner, agent or manager in certain cases -
If the owner, agent or manager, accused of an offence under this Act, proves that another person is the actual offender and that the offence has been committed without his knowledge, consent or connivance, the owner, agent or manager shall be acquitted and the offender shall be punished to the same extent as the owner, agent or manager would have been.

78. Power of court to make orders – If the owner, agent or manager has not remedied the defect in the time period specified in the Court's order, he is deemed to have committed a further offence and is punishable with imprisonment for a term which may extend to six months, or with fine which may extend to one hundred rupees for every day after such expiry on which the order has not been complied with, or with both.

79. Limitation of prosecutions -
No court shall take cognizance of any offence under this Act, unless complaint thereofhas been made –
(i) within six months of the date on which the offence was committed,or
(ii) within six months of the offence came to the knowledge of the Inspector, or
(iia) In any case in which the accused is a public servant , within three months of the date of receipt of government's sanction for prosecution;
(iii) within one year after the date of the publication of the report of a Court of inquiry.

80. Cognizance of offences –
No court inferior to that of a Metropolitan Magistrate or Judicial Magistrate of the first class shall try any offence under this Act which is alleged to have been committed by any owner, agent or manager of a mine or any offence which is by this Act made punishable with imprisonment.

81. Reference to Committee in lieu of prosecution in certain cases -(1) If the court trying any case instituted at the instance of the Chief Inspector or theDistrict Magistrate or of an Inspector under this Act is of opinion that the case is one which should, in lieu of a prosecution, be referred to a Committee it may stay the criminal proceedings and report the matter to the Central Government with a view tosuch reference being made.
(2) On receipt of a report under sub-section(1) the Central Government may refer thecase to a Committee or may direct the court to proceed with the trial.

82. Decision of question whether a mine is under this Act –
If any question arises as to whether any mine comes under the meaning of this Act or not, the Central Government may decide the question, and a certificate signed by a Secretary to the Central Government shall be conclusive on the point.

83. Power to exempt from operation of Act.:(1) The Central Government may by notification in the official Gazette, exempt eitherabsolutely or subject to any specified conditions any local area or any mine or groupor class of mines or any part of a mine or any class of persons from the operation ofall or any of the provisions of this Act or the regulations, rules or bye-laws.

Some of the important notifications are tabled below:

Name of Mine and classes of persons exempted	Provisions from which exemption is granted	Condition attached to exemption
All coal washeries and coke plants(with by-product recovery arrangements)	All	No condition attached
Persons employed on the surface in loading or unloading transport trucks used for transporting ore or other material by road to or from outside destinations, or in loading or un-loading railway wagons and in screening and washing plants and on work of sampling connected therewith.	The provisions contained in Section 36	
Women employed in surface in loading or unloading railway wagons or of sand or in screening and washing plants or in work connected with fighting, isolating and controlling fires.		Provided that no such women so exempted shall be permitted to be employed in such operations between the hours of 10 p.m. & 5 a.m. and notwithstanding anything contained in Sec.30(2) there shall be an interval of not less than eleven hours between successive periods of employment.
Attendants employed on surface in power or boiler houses, engine ,motor or compressor rooms, winding or hoisting, ventilation or air conditioning, mechanical screening, washing , loading or mineral dressing & separating plants, banksmen, signalmen, loco drivers, trollyemen, trammers, lamp checkers & contraband body searches.	Sec 28 and Sub-sec of Sec(30)(2)	The period of work shall not normally exceed eight hours in any day.
Attendants employed belowground on continuously operated machinery, haulage engine drivers, pumpmen, onesetters, signal men and belimen	Sec 28	
Persons employed in welfare services including pit head baths, canteen and crèches ,in the issuing of foodstuffs ,in hospitals and dispensaries, in sanitary or conservancy work other than in underground and workshop premises, in 'watch and ward' and clerks, accountants, timekeepers and orderliness on the surface.	All provisions of Chapter VI excepting the provisions contained in Sec. 28 , 29 , 33, 38, 44, 45, 46 & Sub- sec(1) & (4) of sec 48.	

(Notifications dt.1965,1966,1967,1968)

MULTIPLE CHOICE QUESTIONS

The Mines Act 1952

1. As per The Mines Act 1952 district magistrate cannot apply which of the following section as an inspector of mine ?
   - a) 9
   - b) 22
   - c) 43
   - d) 26
2. Under which section of The Mines Act 1952 provision of occupational health survey is mentioned?
   - a) 9
   - b) 12
   - c) 57
   - d) 9A
3. What is the term of imprisonment for the inspector disclosing secret information?
   - a) 1 year
   - b) 2 year
   - c) 3 year
   - d) 6 month
4. Under which section of The Mines Act 1952 committee is constituted ?
   - a) 9
   - b) 12
   - c) 57
   - d) 9A
5. How many members form a committee constituted under section (9) of The Mines Act 1952 ?
   - a) 8
   - b) 6
   - c) 5
   - d) 7
6. What is the term of office of members of committee except that of CI & Chairman?
   - a) 2 year
   - b) 3 year
   - c) 4 year
   - d) 1 year
7. Member of committee shall tender his resignation , if he intends to be absent from India for a period longer than ________
   - a) 30 days
   - b) 3 month
   - c) 6 month

   - d) 1 year
8. Who shall give notice of meeting of committee?
   - a) Chairman of committee
   - b) Secretary of committee
   - c) Chief inspector
   - d) Owner
9. How many days of prior notice is to be given to members of committee before schedule date of meeting?
   - a) 30 days
   - b) 15 days
   - c) 7 days
   - d) 14 days
10. Agenda of business to be discussed shall reach to members of committee at least ____________ before the meeting.
    - a) 30 days
    - b) 15 days
    - c) 7 days
    - d) 14 days
11. How many members are required to transact meeting of the committee?
    - a) At least 4
    - b) At least 4
    - c) At least 5
    - d) At least 6
12. What should be the quantity of water to be provided at mine where wet bulb temperature exceeds 30^0C?
    - a) 2 liter
    - b) 3liter
    - c) 4liter
    - d) 5liter
13. In case of excavation made for prospecting purpose only, mines act will not be applicable when person employed there are not more than ________
    - a) 50
    - b) 20
    - c) 15
    - d) 6
14. In case of excavation made for prospecting purpose only, mines act will not be applicable when depth of excavation from its highest point to its lowest point nowhere exceeds __________?
    - a) 15 m
    - b) 50 m

c) 20 m
d) 6 m

15. Which section of the mines act empowers the central government to make regulation ?
a) 57
b) 58
c) 60
d) 61

16. Who has the power to make rules and regulations?
a) Central government
b) Committee
c) Either of the above
d) Chief inspector

17. Which section of the mines act prohibit employment of person below 18 years of age ?
a) 40
b) 45
c) 46
d) 43

18. According to mines act what is the time of work for a woman working in a belowground mine?
a) 6am-7pm
b) 6am-10pm
c) 10pm-5am
d) None

19. Manager may appeal against an order made by an inspector under section 22 of mines act within ____________ after receipt of order?
a) 10 days
b) 20 days
c) 2 month
d) 14 days

20. What is the rate of leave with wages in case of person employed belowground mine ?
a) One day for every 15 days
b) One day for every 20 days
c) One day for every 10 days
d) 2.5 days for every 30 days

21. In case of person working belowground, calendar year service shall be deemed to have been completed if his attendance is not less than____?
a) 240

b) 140
c) 190
d) 200

22. As per The Mines Act 1952 how many days of maternity leave should be given to woman employee?
a) 4 weeks
b) 12 weeks
c) 3 months
d) 6 weeks

23. According to mines act what is the time of work for a woman working in a above ground mine?
e) 6am-7pm
f) 6am-10pm
g) 10pm-5am
h) None

24. No adult shall be allowed to work above ground for more than ________ in a week ?
a) 48 hours
b) 49 hours
c) 54 hours
d) 60 hours

25. No person other than supervising staff shall be allowed to work in a mine if he has already been working in any other mine within the preceding________
a) 8 hours
b) 9 hours
c) 14 hours
d) 12 hours

Answers

1.b 2.d 3.a 4.b 5.a 6.b 7.c 8.b 9.d 10.c 11.a 12.b 13.b
14.d 15.a 16.a 17.a 18.d 19.a 20.a 21.c 22.b 23.a 24.a 25.d

THE MINES RULES, 1955

MEDICAL EXAMINATION OF PERSONS EMPLOYED OR TO BE EMPLOYED IN MINES

29A.Applicability of this Chapter - Nothing in this Chapter shall apply to persons who are employedpurely on temporary or causal basis for a continuous period not exceeding six months.

29B.Initial and periodical medical examinations -The periodical medical examination of every person employed in the mine shall be done at intervals ofnot **more than five years.**

For the persons who are engaged in the process of mining or milling of asbestos ,periodicmedical examination shall be done at least **once in every twelve monthsand** every such examination shallinclude all the tests in **Form "P"** of the **First Schedule** except the **X- Ray examination**, which shall becarried out once in every **three years.**

29.C.Examining authorities - The medical examination aforesaid shall be carried out by a Medical Officerappointed for the mine or a Medical Officer in the employment of the owner of the mine, if any, or by anymedical officer employed in the Coal Mines Welfare Fund Organisation or any other mines Welfareorganisation, failing which by any State or Central Government medical officer not below the rank of anAssistant Civil Surgeon.

29D. Notice of medical examination - (1) In respect of every medical examination under rule 29B, themanager of the mine concerned shall give at least **twenty days'** prior notice in writing to the person to beexamined, in **Form M.**

A person, who for any reasonable cause, fails to submit himself for a medical examination, shall be given a second notice of aminimum period of **ten days** in **Form N.**

29E. **Failure to undergo medical examination** –If a person after giving notice also, without reasonable cause, fails to submithimself for medical examination shall be liable to be discharged from service;

If in show cause his explanation is found satisfactory by the management; he shall be givenanother chance to appear for medical examination.In case his explanation is not found satisfactory by themanagement, his service shall be terminated by the management :

Provided further that in case of any dispute, the same shall be referred to the Chief Inspector for his decision within **60 days** of the order communicated by the owner, agent or manager of the mine to thesaid person.

29F. Standard and report of medical examination - The examining authority shall examine initial medicalexamination (**who is already employed**), or periodical medical examination of a person according to **Form P** and the initial medicalexamination of all persons **seeking employment** in a mine shall be according to the**Form P-I.**

Medical certificate shall be issued in **Form-O.**

29J.Appeal for re-examination - Where as a result of medical examination, a person has been declared unfit foremployment in mines, he may**within thirtydays** file an appeal with the manager, and request for a medical re -examination by an Appellate Medical Board constituted under rule **29K.**

(2)(a) The **manager** shall **arrange** to have the appellant medically re -examined by the Appellate MedicalBoard **within thirty days** of the receipt of the Appeal, and shall give to the Appellant fifteen days' priornotice of the medical re-examination by the Appellate Medical Board in **Form Q.**

(b) A person, who for any **reasonable cause, fails to submit himself** for a medical re-examination , shall be given another notice in **Form R** insimilar manner.

(c) A person who has, without reasonable cause, fails to submit himself for a medical re -examination shall cease to be in employment at the mine or ina particular category of mines or in any specified operations in mine, as the case may be, after theexpiry of thirty days from the last date notified for his medical re-examination.

29K. **Constitution of Appellate Medical Board** - For the purpose of medical re - examination onappeal, the Appellate Medical Board shall consist of the following officers, namely :

(a) One duly qualified Medical Officer in the employment of the Directorate General of Mines Safety whoshall also act as the Convenor of the Board.
(b) One Medical Officer duly qualified in allopathic system of medicine to be nominated by the ChiefInspector in consultant with the Welfare Organisation set up by the Central Government for the personsemployed in the mine.
(c) One Medical Officer duly qualified in allopathic system of medicine employed in the State or CentralGovernment or a Government undertaking and not below the rank of Assistant Civil Surgeon.

Provided that if a Medical Officer under clause (b) or clause (c) is not available, the AppellateMedical Board shall be constituted with two persons only.

29L. Standard and report of medical re-examination by the Appellate Medical Board–TheAppellate Medical Board shall medically examine the appellant in accordance with the standard laid downin Form P for initial medical examination of workers already in employment as well as periodical medicalexamination and in accordance with the standard laid down Form P-I for initial medical examination of thepersons to employed and shall issue to the manager of the mine concerned and to the appellant a medicalcertificate in Form S.

29M. Unfit persons not to be employed- Where, a person has beendeclared unfit he shall not be employed in mine or in the category of mines or on theoperations specified, after the expiry of thirty days from the date of his medical examination unless he has filed an appeal.

Provided that, if the Medical Officer/ Appellate MedicalBoard carrying out medical examination or re-examination of persons already in employment is of the opinionthat the disability of the person examined is of such a nature and degree that it will not seriouslyaffect or interfere with the normal discharge of his duties, it may recommend his continuation inemployment in the mine for a period not exceeding six months during which such person may gethis disability cured or controlled and submit himself for another medical examination and bedeclared fit.

29P. Annual returns - (1) **On or before the 20th day of February** every year, the manager of every mineshall submit to the Chief Inspector annual returns in respect of the preceding calendar year in **Form T.**

(2) If a mine is abandoned or working thereof is discontinued over a period exceeding sixty days or if achange occurs in the ownership of a mine, the returns shall be submittedwithin thirty days of abandonment or change of ownership or within ninety days of discontinuance, asthe case may be.

WORKMEN'S INSPECTOR AND SAFETY COMMITTEE

29Q Workmen's Inspector - (1) (a) For every mine where **500 or more** persons are ordinarily employed,the owner, agent or manager shall designate three(one each for mining operations, electrical installations and mechanicalinstallations) suitably qualified employees of the mine in consultationwith the registered trade union in the mine.

When the number of persons employed in a mine **exceeds 1500**, the Workmen's Inspectorshall be assisted by one additional Workmen's Inspector in mining discipline for **every additional 1000**persons or part thereof.

(2) No person shall act as a Workmen's Inspector of a mine unless –
(a) he possesses an Overman's or Foreman's Certificate granted under the Act :

(i)In relation to electrical machinery installed in mines, a person holding a valid Electrical Supervisor'sCertificate of Competency covering mining installations.
(ii) In relation to other machinery and mechanical appliances installed in mines a person appointed shall not be less in status than that of an Overman, Mine Foreman or Electrical Supervisor
(b) he has at least five years of experience in mines including at least two years in workings of the minesfor which he is nominated,and
(c) he has undergone an **orientation training** course for Workmen's Inspector consisting of **not less than thirty lectures** and demonstrations, of **not less than two hours'** duration each.
(3) The Workmen's Inspector shall perform the duties as workmen inspectorfor **two days** in every week

FMC Exam 2015

For how many days Workmen Inspector shall perform duties as Workmen Inspector ?

a) 2
b) 3
c) 4
d) 5
e) 6

Ans: (a) 2

(4) (a) The owner, agent or manager shall afford the Workmen's Inspector all reasonable facilities formaking any entry, inspection, measurement, examination or inquiry in connection with his duties .
(b) An official of the mine shall accompany the Workmen's Inspector during his inspection.
(c) The Workmen's Inspector may carry out his inspection at any time.
(5) When there occurs an accident or dangerous occurrence in or about a mine , the owner, agent ormanager shall forthwith inform the concerned Workmen's Inspector about the accident or theoccurrence.
(6) The Workmen's Inspector shall not exercise his powers to impede or obstruct the working of the mine.
(7) A Workmen's Inspector nominated under sub-rule(1) shall, unless he resigns from his office, holdoffice for a period of three years from the date of his nomination and shall be eligible for one renomination.
(8) No owner, agent or manager shall take any action against a Workmen's Inspector for any of his actionsin the discharge of his duties and functions laid down in these rules.

29R. Duties of Workmen's Inspector - (1) The duties of the Workmen's Inspector shall be -

(a) to inspect all shafts, inclines, roads, workplaces and the equipment thereat including the equipment forconveyance and transport of workers;

(b) in case of any urgent and immediate danger that comes to his notice ;

i) to inform the manager and the Inspector about the same; and

ii) to suggest remedial measures necessary to avoid the danger ; and

(c) to accompany the Inspector in the course of complete inspection of the mine and also during suchother inspections as may be considered necessary by the Inspector.

(2) The Workmen's Inspector shall record a full report of the matters in **Form U.**

29S. Action on the report of Workmen's Inspector -

(1) The owner, agent or manager of the mine shall take remedial measures within a period of 15 days from the date of entry in the register .

(2) In case of any difference of opinion between the Workmen's Inspector and the owner, agent ormanager, matter shall be sent by the owner, agent or manager to the Chief Inspector or an Inspector for decision.

29TSafety Committee - For every mine wherein more than 100 persons are ordinarily employed, theowner, agent or manager shall constitute a Safety Committee for promoting Safety in the mine;

29U Composition of Safety Committee -The Safety Committee shall consist of :-

(a) the manager who shall be the Chairman ;

(b) five officials or competent persons of the mine nominated by the Chairman ;

(c) five workmen nominated by the workmen of the mine in accordance with the procedure prescribed inclause (a) of sub-rule(1) of rule 29Q for nomination of Workmen's Inspector;

(d) Workmen's Inspector where so designated; and

(e) the Safety Officer, or where there is no Safety Officer, the senior most mine official next to themanager, who shall act as Secretary to the Committee;

Provided that any other official, competent person or work person may be co-opted by the Chairman as amember of the Committee on any day or days of the meeting, if considered necessary.

29V. Functions of Safety Committee - The functions of the Committee shall be-

(1) to discuss remedial measures against the unsafe conditions and practices in the mine as pointed out by Workmen's Inspector or otherwise brought to the notice of the Committee and makeappropriate recommendations;

(2) to consider, before commencement of operations in any new district of mine or commissioning of newelectrical or mechanical installation or introduction of new mining technique, the proposed Safety andhealth measures including related codes of practice and to make appropriate recommendations;

(3) to discuss the report of inquiry into accident and make appropriate recommendations;

(4) to formulate and implement appropriate Safety campaign based on analysis of accidents;

(5) to meet at **least once in 30 days**

(6) to serve as a forum for communication on Safety and occupational health matters.

29W .Implementation of recommendations of the Safety Committee - The owner, agent or managershall, **within a period of 15 days** from the date of receipt of the recommendations of the Safety Committee,shall indicate to the Secretary to the Safety Committee, the action taken to implement therecommendations.

Pit Safety Committee

1. **Formation**

   At every mine employing 100 persons and above, a Pit Safety Committee shall be formed.

2. **Composition**

   The following shall be the members of the committee in a gassy mine employing 500 persons and above:

1. Manager	1	10. Dust incharge	1
2. Ventilation Officer	1	11. Fitter	1
3. Assistant Manager	1	12. Timberman	1
4. Engineer	1	13. Line Mistry	1
5. Safety Officer	1	14. A trammer	1
6. Welfare Officer	1	15. Engine Driver	1
7. Medical Officer	1	16. Face Workers	1
8. Overman/Foreman	1	17. One from each shift	1
9. Sirdar/Mate	1	18. Surveyor	1
		19. Shot-firer/Blaster	1

3. **Term of office of members shall be of one year.**

   Provided that except for manager, welfare officer, safety officer, ventilation officer, engineer, assistant manager(if there is only one) all other members shall be rotated after a year, as far as possible in order of seniority.

4. **Quorum and Meetings**

   i. 60% of the total membership shall constitute a quorum. Provided that if a meeting is postponed due to lack of quorum , the next meeting shall be held irrespective to the quorum.

ii. The manager shall preside over every meeting of PSC. In his absence, the next senior-most person of the managerial staff shall take the chair.
iii. The safety officer shall act as the Secretary of the committee.
iv. The committee shall hold atleast one meeting in every month.

(Cir. 49/1964 and 21/1966)

HEALTH AND SANITATION PROVISIONS

33. Surface latrines and urinals. -The scale of latrine accommodation shall be at least one seat for every 50 males and at least one seatfor every 50 females employed at one time.

37. Underground latrines - If in any mine more than fifty persons are employed underground then latrines shall be provided underground.

FIRST-AID AND MEDICAL APPLIANCES

40. Arrangements for training persons in first-aid etc.-(1) It shall be the duty of the owner, agent or manager of a mine to see that adequate and suitable arrangements are made for the training of persons in first-aid.

43.First-aid rooms - (1) At every mine employing more than 150 persons on any one day of thepreceding calendar year, there shall be provided and maintained in good order a suitable first-aid room.
(3) The first-aid room shall have a floor space of not less than 10 square meter and shall contain at least the equipment specified in the Second Schedule.
(4)The firs t-aid room shall be in charge of a qualified medical practitioner, where the number of persons ordinarily employed in a mine is **more than 1000.**

44. First aid stations.-(1) At every mine there shall be provided and maintained first-aid equipment as prescribed in the **Third Schedule**, at conveniently accessible stations where injured persons may receive first-aid treatment, as follows :
(a) above ground, a first- aid station –
(i) at the top of every shaft or incline where men or material are normally wound or hauled;
(ii) in every workshop;
(iii) at every screening plant and loading place; and
(iv) at every other place where more than 50 persons are employed at any one time.
(b) In every opencast working, one first-aid station for every 50 persons or part thereof, employed at any one time; and
(c) below ground, one first-aid station -

i) at the bottom of every shaft where men or material are normally wound, and at or near every plant;
ii) near the drive end of every haulage;
iii) in or at the entrance to every district or section of the mine;
There shall not be first aid station within 300 meters of another first-aid station.

WELFARE AMENITIES

62. Provision of shelters - At every mine where more than 50 persons are ordinarily employed, there shall be provided adequate and suitable shelters at or near loading wharves, opencast workings, workshops and mine entrances where 25 or more persons are ordinarily employed for taking food and rest.

> Rest shelters are the only place which afford protection from sun and rain and where the workers can take food and rest. So it is considered to provide rest shelter even if the employment is less than 50 but in this case construction of shelters need not conform to the standards laid down by the Directorate.

(Cir. 25/1972)

63. Standards of Shelters - Every shelter shall –
(a) have a floor area of not less than 14m^2; and
(i) in the case of flat roof a height of not less than 2.5 m to the lowest part of the roof; and
(ii) where the roof is a sloping one, a height of not less than 1.8 m to the lowest part of the roof and of not less than 2.5 m to the highest part of the roof;

64. Provision of Canteens - (1) At every mine where in more than 250 persons are ordinarily employed if the Chief Inspector or an Inspector so requires, there shall be provided and maintained in or adjacent to the precincts of the mine, a canteen for the use of all persons employed .

65. Standards of canteen – (1) Every canteen shall-
a) be situated not less than 15 m from any latrine, urinal, boiler house, engine room, coal heap, ash heap or heap of other material and any other source of dust or smoke;
b) be white-washed or colour washed inside the rooms and passages at least once a year, and woodwork and structural iron or steel work shall be varnished or painted at least once every three years.

Provided that the inside walls of the kitchen shall be white washed or colour-washed once every four months.

69. Canteen Managing Committee -(1) The owner, agent or the officer in charge canteen shall appoint a Canteen Managing Committee.

(2) (a) The Committee Shall consist of an equal number of members nominated by the owner, agent 'or officer in-charge canteen and elected by the persons employed in the mine. The number of elected members shall be on a scale of one for every 1000 persons employed, provided that the number shall not be more than 5 or less than 2.

(b) The term of office of the elected members shall be two years commencing from the date of the last election.

72. Welfare Officer – 1) For every mine wherein 500 or more persons are ordinarily employed the owner, agent or manager shall appoint a suitably qualified person as Welfare Officer, and where the number of persons so employed in a mine exceeds 2500 ,such Welfare Officer shall be assisted by one suitably qualified additional Welfare Officer for every additional 2000 persons or part thereof employed.

(2) No person shall act as a Welfare Officer of a mine unless he possesses -

(a) a university degree ;

(b) a degree or diploma in social science, or social work or labor welfare recognized by the Government for the purpose of this rule, and preferably practical experience of handling labor problems in any industrial undertaking for at least three years.

(3) Where due to any reason ,the Welfare Officer is unable to perform his duties, the owner, agent or manager shall authorize in writing person whom he considers competent, to act in his place ;

Provided that no such authority shall have effect for a period in excess of 30 days except with the previous consent of the Chief Inspector.

(4) A written notice of every appointment, authorization, discharge, dismissal, resignation or termination of service of every Welfare Officer and of the date thereof shall be sent by the owner, agent or manager to the Chief Inspector within seven days from the date of such appointment, authorization. discharge, dismissal, resignation or termination of service.

73. Duties of Welfare Officer –(1) The duties of Welfare Officer shall be -

(i) to establish and maintain harmonious relations between themanagement and persons employed in the mine ;

(ii) to bring to the notice of the management the grievances of employees, individual as well as collective,with a view to securing their expeditious redressal ;

(iii) to promote relations between management and employees

(*iv*) to assist in the formation of Work and Joint Production Committees, Co - operative Societies and SafetyFirst and Welfare Committees and to supervise their work ;

(*v*) to help the management in regulating the grant of leave with wages and explain to the workers theprovisions relating to leave with wages and other leave privileges and to guide the workers in the matterof submission of applications for grant of leave for regulating authorised absence.

(*vi*) to advise on welfare provisions such as housing facilities, food-stuffs, social and recreational facilities,sanitation, individual personnel problems and education of children;

(*vii*) to supervise welfare activities, statutory or other wise including education and training of employees;

(*viii*) to suggest measures which will tend to raise standard of living of workers and in general promotetheir being ; and

(*ix*) to perform any other duty connected with the welfare of the persons employed in the mine.

(2) Notwithstanding anything contained in sub-rule(1), no Welfare Officer shall deal with any disciplinarycase again a person employed in a mine, or appear before a Conciliation Officer, Court or Tribunal onbehalf of the management of a mine against a person or persons employed in the mine, except when he isrequired by the Conciliation Officer, Court or Tribunal to appear as an independent witness;

Provided that nothing in this sub-rule shall be deemed prohibit a person employed in a mine fromapproaching the Welfare Officer in respect of a grievance arising out of any case of disciplinary action against him.

DGMS Circulars

- Guidelines on Occupational Health Survey : (Medical Examination of persons working at places or operations/processes prone to generate airborne dust.

A. **Medical Examination** of persons working at places prone to generate airborne dust should be conducted once in **every six months**.

B. **Sputum examination** for Tuberculosis **once in every year.**

C. A single posterior-anterior chest X-ray should be done every 5 years on workers without signs of silicosis or other pneumoconiosis and every 3 years on workers who do have X-ray changes.

D. IME should be conducted for all mining workers whether permanent, temporary or contractual before they are engaged in any mining job.

(Cir. Tech 1/2011)

- Periodic Medical Examination of mining employees above the age of 60 years.

PME of all the employees statutory or non-statutory above 60 years engaged in mining operations should be conducted once in every year.

(Cir. Tech. 3/2012)

Forms & Their Descriptions

FORM – A	Employee registeri.e Details of employees	As per DGMS Cir (Leg)-01 27Apr 2017 Ease of compliance to maintain register under various labour law rules,2017
FORM –B	Wage register	
FORM –D	Attendance register i.e. Register of persons employed below ground /above ground/ opencast working	
FORM E	Format of register of rest/leave/leave wages, Register of leave with wages	
FORM – J	Return of Reportable accident	
FORM – K	Return of Minor Accidents	
FORM – L	Information regarding leave with Wages	
FORM M	Notice of initial/ periodical medical examination	
FORM – N	Second and final notice of initial/periodical medical examination	
FORM – O	Report of medical examination	
FORM – P	Medical Standard of fitness for Persons Employed	
FORM – P-I	Medical standard of fitness for persons to be employed in mines.	
FORM – Q	Notice of medical re-examination by Appellate Medical Board	
FORM – R	Second and final notice of medical re-examination by Appellate	
FORM – S	Report of medical re-examination by Appellate Medical Board	
FORM – T	Annual Return for the year ending on the 31st December	
FORM – U	Record of inspection done by workmen inspector	

MULTIPLE CHOICE QUESTIONS

MINE RULES 1955

1. PME of every person employed in mine shall be carried out at interval not more than____________?
   - a) 3 years
   - b) 5 years
   - c) 1 year
   - d) 4 years
2. PME of person who are engaged in the process of mining or milling of asbestos shall be done at least once in every____________?
   - a) 6 months
   - b) 3 months
   - c) 3 years
   - d) 12 months
3. PME/IME shall be carried out by-
   - a) Medical officer appointed for the mine
   - b) State govt. medical officer not below the rank of assistant civil surgeon
   - c) Central govt. medical officer not below the rank of assistant civil surgeon
   - d) Any of the above
4. Manager of mine shall give at least ______ prior notice to the person to be examined for IME/PME?
   - a) 10days
   - b) 15 days
   - c) 20 days
   - d) 30 days
5. Who gives notice to the person to be examined for IME/PME?
   - a) Medical officer
   - b) Owner
   - c) Agent
   - d) Manager
6. Manager of mine shall give prior notice to the person to be examined for IME/PME in __________?
   - a) Form M
   - b) Form N
   - c) Form P
   - d) Form O
7. A person who fails to submit himself for PME/IME shall be given second notice of a minimum period of_______?

   - a) 10days
   - b) 15 days
   - c) 20 days
   - d) 30 days
8. Second notice to the person who failed to undergo PME/IME shall be given in ______?
   - a) Form M
   - b) Form N
   - c) Form P
   - d) Form O
9. PME shall be done according to the standard laid down in ______?
   - a) Form M
   - b) Form N
   - c) Form P
   - d) Form O
10. Medical certificate after PME/IME shall be issued in ____________?
    - a) Form M
    - b) Form N
    - c) Form P
    - d) Form O
11. A person who has undergone PME/IME may appeal for re-examination within______ receipt of medical certificate.
    - a) 10days
    - b) 15 days
    - c) 20 days
    - d) 30 days
12. A person who has undergone PME/IME may file an appeal for re-examination with the ________?
    - a) Medical officer
    - b) Owner
    - c) Agent
    - d) Manager
13. Manager shall arrange to have the appellant medically re-examined by the appellate medical board within_________ of the receipt of the appeal.
    - a) 10days
    - b) 15 days
    - c) 20 days
    - d) 30 days
14. If a person called for medical re-examination fails to submit himself , then another notice shall be given to him in ___________?

a) Form P
b) Form Q
c) Form R
d) Form S

15. Appellant medical board is constituted under section________ of mines rules'1955.
a) 29B
b) 29K
c) 29J
d) 29C

16. Appellate medical board examine the appellant in according with the standard laid down in _________ for IME of workers already on employment.
a) Form P
b) Form Q
c) Form P-I
d) Form S

17. Appellate medical board issue medical certificate in _________?
a) Form P
b) Form Q
c) Form R
d) Form S

18. Workmen's inspector is constituted under, where number of employed person exceeds__________?
a) 499
b) 500
c) 1500
d) 150

19. Workmen's inspector shall be selected from which of the following operations?
a) Civil
b) Electrical
c) System
d) Personnel

20. How many workmen's inspector shall be there in a mine where 3000 person employed?
a) 3
b) 4
c) 5
d) 6

21. There are four workmen's inspector in a mine. How many person may be employed in that mine?

a) 1600
b) 3000
c) 1500
d) 2800

22. Workmen's inspector shall perform duties of workmen's inspector for______ in a week.
a) 2 days
b) 3 days
c) One day
d) 4 days

23. Terms of workmen's inspector is ________?
a) Two years
b) Three years
c) 12 months
d) 5 years

24. Workmen's inspector can be renominated for___________.
a) Two times
b) One time
c) Three times
d) Any number of time

25. Workmen's inspector shall maintain his report in_________.
a) Form R
b) Form S
c) Form T
d) Form U

26. OAM shall take action against the matter reported by workmen's inspector within_______.
a) 24 hours
b) 72 hours
c) 15 days
d) 14 days

27. Safety committee is constituted under section________ of mines rules'1955.
a) 29 K
b) 29 Q
c) 29 V
d) 29 T

28. Safety committee is constituted in a mine where more than _________persons are employed.
a) 100
b) 150

c) 500
d) 1500

29. Who constitute a Safety committee ?

i. Owner
ii. Agent
iii. Manager
iv. RI

a) Only i
b) i& ii
c) i,ii,iii,iv
d) i,ii or iii

30. Who shall be the chairman of Safety committee?

a) Manager
b) Safety officer
c) Workmen inspector
d) Agent

31. Who among the following cannot be the member of Safety committee ?

a) Competent person
b) Overman
c) Foreman
d) None of the above

32. Who shall act as the secretary to the committee?

a) Manager
b) Safety officer
c) Workmen's inspector
d) Agent

33. What percentage of total membership of safety committee constitute a quorum ?

a) 40 %
b) 50 %
c) 51 %
d) 60 %

34. Floor space of first aid room shall not be less than________.

a) 10 m^2
b) 14 m^2
c) 18 m^2
d) 100 m^2

35. First aid room shall be in the charge of a qualified medical practitioner, where persons employed in mine is more than________.

a) 150
b) 50

c) 1000
d) 500

36. There shall not be first aid station within ________ of another first aid station.

a) 100 m
b) 300 m
c) 500 m
d) 150 m

37. How many welfare officer shall be there in a mine where 6000 persons are employed?

a) 2
b) 3
c) 4
d) 5

Match the Following

38. As per Mines Rules'1955 match the following

	Form		Description
P	Form B	I	Wage Register
Q	Form A	II	Reportable accident details
R	Form J	III	Minor accident details
S	Form K	IV	Employee Register

a) p-iii, q-i, r-ii,s-iv
b) p-iv, q-ii, r-i,s-iii
c) p-iii, q-ii, r-i,s-iv
d) p-i, q-iv, r-ii,s-iii

39. As per Mines Rules'1955 match the following

	Form		Description
P	Form M	I	Second and final notice of medical examination
Q	Form N	II	Notice of medical re-examination by medical appellate medical board
R	Form Q	III	Second and final notice of medical re-examination by appellate board
S	Form R	IV	Notice of medical examination

a) p-ii, q-i, r-iv,s-iii
b) p-iv, q-ii, r-i,s-iii
c) p-iii, q-ii, r-i,s-iv
d) p-iv, q-i, r-ii,s-iii

Answers

1.b 2.d 3.d 4.c 5.d 6.a 7.a 8.b 9.c 10.d 11.d 12.d 13.d
14.c 15.b 16.a 17.d 18.a 19.b 20.c 21.a 22.a 23.b 24.b 25.d
26.c 27.d 28.a 29.d 30.a 31.d 32.b 33.d 34.a 35.c 36.b 37.b
38.d 39.d

THE MINES RESCUE RULES, 1985

RESCUE STATIONS AND RESCUE ROOMS

3. Establishment and location of rescue station;- (1) The Chief Inspector may permit or require; theowner of a below ground mine or a group of below ground mines to establish and maintain rescuestation ,stations with such designs and specifications and at; such place/ places as may be considerednecessary in consultation with the owner:

Provided that where there are below ground mines belonging to more than one owner, the ChiefInspector may permit or require two or more owners to jointly establish a common rescue station.

(2) At every rescue station there shall be appointed one Superintendent and at least two instructors and also, there shall be maintained **a rescue brigade** of not less than **eighteen** rescue trained persons.

(3) In case where the absence of the Superintendent at a rescue station exceeds 60 days, the owner shall appoint another Superintendent.

(4)The owner shall, within seven days from the date of assumption or relinquishment of charge by the Superintendent, inform the Chief Inspector and the Inspector in-charge of the region where the mine is situated in Form I.

SMC Exam'14

How many rescue trained persons are there in a rescue brigade?

a. 12
b. 18
c. 6
d. 5
e. 10

Ans : (b) 18

4. Functions of rescue stations:- The functions of rescue station shall include:

(i) imparting initial training in rescue and recoverywork;
(ii) imparting refresher training to rescue trained persons;
(iii) providing support by its own rescue teams and equipment in case of major accidents or longlasting rescue and recovery operations; and
(iv) carrying out the functions of rescue room in respect of these below ground mines where there is no rescue room.

5.Establishment and location of rescue rooms:- (1) At every below ground mine where, more than 100persons are ordinarily employed below ground and there is no rescue station within its radius of 35 kms.
The owner, shall establish and maintain on surface close to mine entrance a rescue room.
Provided that it may be sufficient to provide one rescue room for a number of mines belonging to the same owner where:-
(a) the total number of persons ordinarily employed in below ground workings of all such mines **does not exceed 5000**; and
(b) The mines are situated radius of 35 kms.
Provided further that the Chief Inspector may permit the owner of a group of mines having the total number of persons ordinarily employed below ground in excess of **5000**, to use the rescue room as a rescue station excepting the functions of imparting initial training in rescue work, if such rescue room is:

(a) equipped with requisite additional rescue apparatus including at least 15 extra sets of two hour self- contained breathing apparatus; and

(b) placed under the charge of an instructor and a minimum of five rescue trained persons of whom at least one shall hold the qualification of rescue room in charge.

(2) In the case of below ground coal mines having a fiery seam or gassy seam of second or third degree, the Chief Inspector may require the owner to establish and maintain a rescue room irrespective of the number of persons ordinarily employed below ground.

6. Functions of rescue room:- A rescue room shall provide facilities for the storage, assembly,testing and adjustments of breathing apparatus and other rescue equipment and apparatus and for theirspeedy transport to mines.

Qualification table of Superintendent, instructor and rescue room incharge.

7. Superintendent	8. Instructor	10.Rescue room incharge
Rescue Trained person	Rescue Trained person	Rescue Trained person
5 year experience of belowground working	3 years experience of belowground working	3 years experience of belowground working
First Class Manager's Certificate not restricted to open cast workings	Manager's certificate of a type not restricted to open cast workings	Manager's ,Overman's or Foreman's Certificate certificate not restricted to open cast workings

9. Selection of rescue trained persons for posting at rescue stations:- (1)The rescue trained persons for posting at a rescue station shall be selected, from amongst the rescue trained persons employed in mines served by the rescue station, by the Superintendent in consultation with the managers of such mines.
(2) A person selected under sub-rule (1) shall be posted for **not less than one year and not more than five years** at a rescue station at any one time.
11. Equipments:- (1)At every **rescue station** there shall be provided apparatus and equipment as specified in Schedule I.
(2) At every **rescue room** there shall be provided apparatus and equipment as specified in **Schedule II.**
(3)At a below ground mine, where **no rescue room** is located, apparatus and equipment as specified in **Schedule III**, shall be maintained at the entrance of such mine.
(5)The following apparatus and equipments provided in pursuance of sub-rules (1), (2) and (3),of standard approved by the Chief Inspector, namely:-
(a) breathing apparatus;
(b) smoke helmets and apparatus serving the same purpose;
(c) reviving apparatus;
(d) electric safety lamps and flame safety lamps;
(e) gas detector; and
(f) self rescuers.
(6) All breathing apparatus and every flow meter shall be adjusted; and tested and the purity of oxygen for use in breathing apparatus shall be tested in such manners as are laid down in Schedule IV.

(7)In case of an accident in a below ground mine arising out of the use of any rescue apparatus, a written report thereof shall be sent, **within 24** hours of such accident, by the **manager** of the mine to the Chief Inspector **and** Regional Inspector in **Form II.**

(8)In case of an accident in a rescue station or rescue room arising out of the use of any rescue apparatus a written report thereof shall be sent , within 24 **hours** of such accident, by the Superintendent to the Chief Inspector and Regional Inspector in **Form II.**

Duties and responsibilities of superintendents etc.

12.Duties and responsibilities of Superintendent.- (1) The Superintendent shall be in overallcontrol of the rescue station and the rescue rooms served by such rescue station.

(2)The Superintendent shall ensure that all the rescue equipment and apparatus kept at the rescuestation, rescue rooms and at the entrance of the below ground mines under his control are-

(a) maintained in perfect working order;

(b) inspected by Instructors at specified intervals; and

(c) tests are conducted and adjustments are made.

(3)The Superintendent shall ensure that adequate stock of spare parts and supplies are kept formaintaining rescue equipment and apparatus in perfect working order.

(5)The Superintendent shall ensure that persons selected for initial training and those undergoingrefresher training receive the prescribed course of instructions and practices and are issued the creditcertificates for the same.

(6)The Superintendent shall make periodical inspection rescue rooms and the apparatus andequipment under his control.

(7)In the event of an emergency at a below ground mine, Superintendent shall perform such rescueand recovery work as may be assigned to him by the manager or in his absence by the principal officialpresent at the surface. He shall within three **days** of completion of the rescue or recovery work send a reportthereof to the Regional Inspector or the Chief Inspector.

(9)The Superintendent shall submit to the Chief Inspector and to the Regional Inspector detailedreport on the functioning of the rescue station and rescue rooks under his control in the preceding year onor before the 20thl day of February of the succeeding year.

13.Duties of Instructors:- (1) Under the direction of Superintendent the Instructor shall-(a) impart course of instructions and practices to persons selected for training in rescue andrecovery work as well as to rescue trained persons and maintain a record thereof; and

(b) make inspection, test and adjustment of rescue equipment and apparatus and maintain arecord thereof.

(2)In the event an emergency at a below ground mine, Instructors shall perform such rescue andrecovery work as may be assigned to him by the manager or in his absence by the principal official presentat the surface.

(3)Instructor shall not leave the rescue station without prior permission of the Superintendent.

(4)In the absence of the Superintendent, the Instructor shall be incharge of the rescue station

Organisation and equipment in mines

18.Rescue tracings:- There shall be kept at a below ground mine, more than three legible tracingsof the working of the mine upto a date not before three preceding months. The tracing shall show thesystem of ventilation in the mine, and in particulars, the general direction of aircurrent, every point wherethe quantity of air is measured, every air-crossing, ventilation-door stopping, booster fan and any otherprincipal device for regulation and distribution of air, fire-dams, preparatory stoppings , every fire-fightingequipment, every water-dam with dimensions and other particulars of construction, every pumping,telephone and ambulance station, every room used for storing inflammable material, reserve stations andevery haulage and travelling roadway.

FMC 2015

How many rescue tracing should be kept at belowground mine?

a) 2

b) 3

c) 1

d) None

Ans- (d) None

19.Appointment of rescue trained persons in mines:- (1) Themanager of a below ground mine, where **more than 100 persons** are ordinarily employed below ground,shall ensure that **at least 5 rescue trained persons** are readily available at surface at any time.

(2)The manager of a below ground mine, where **more than 500 persons** are ordinarily employedbelow ground , shall also ensure that persons on a scale of **one man for every 100 persons** or part thereofare rescue trained persons.

20.Selection of persons for training in rescue work:- No person shall be selected for training in rescuework, unless:-

(i) he is between 21 and 30 years of age and holds a valid First-aid certificate of the standard of the St. John Ambulance Association (India);

(ii) he is certified by the Manager that he has sufficient underground experience for thepurpose of rescue work;

(iii) he is certified by a qualified medical practitioner, as may be designated by the Managerafter examination in accordance with Schedule VI, to be free from any organic disease orweakness and to be fit for undertaking rescue work; and

(iv) he is considered by the Superintendent of Rescue Station, after such examination andinterview as he considers necessary , to be suitable for rescue work with breathing apparatus.

21.Instructions and practices etc.-(1) Every person selected for training in rescue work shallundergo the course of instrictions and practices as set out in Part I of **Schedule VII.**

(2) Rescue trained person shall undergo practices and receive instructions as set out in Part II ofSchedule VII.

22.Medical examination etc. of rescue trained person:- Every rescue trained person shall be reexaminedonce at least in every twelve months by a qualified medical practitioner as may be designated bythe manager in accordance with Schedule VI.

Conduct of Rescue Work

24.Duties of Manager etc. in emergency:- (1) On receiving information of any emergency likely torequire the services of a rescue team, the manager, or in his absence the Principal Official present at thesurface, shall immediately:-
(a) inform the rescue room or the rescue stations serving the mine for necessary assistance;
(b) summon rescue trained person employed in the mine;
(c) inform the owner, agent or manager of nearby mines to make available the services of rescuetrained persons employed therein: if so required;
(d) inform the rescue station about the nature of the occurrence; stating whether assistance wouldbe needed from the rescue station;
(e) summon medical assistance; and
(f) send information of the occurrence to the Regional Inspector.

(2)All rescue and recovery work at a below ground mine shall be conducted under the control,direction and supervision of the **manager** of the mine or in his absence the principal official present at thesurface.

In the event of a major emergency, such as ignition, explosion , big underground fireor an accident involving a number of persons, the manager or the principal official shall, in taking decisionsregarding rescue and recovery operations, take guidance froma **Senior Official of the management a representative each from the Director General of Mines Safety, concerned rescue station and the recognised Union of the Workers**, so however that he must take necessary decisions and direct theoperations as the situation warrants, without waiting for the constitution or deliberations of the said group.

27.Fresh air bases:- (1) As soon as possible, base or bases shall be established in fresh air, as nearto the irrespirable zone or zones as safety permits, Every such base shall, if possible be connected bytelephone:
(i) if the base is **below ground** to the surface ; or
(ii) if the base is **on the surface**, to the shaft bottom

there should be provided at suchbase:-
(a) two persons, of whom one shall be a qualified medical practitioner if practicable, and other shall be a rescue trained person;
(b) a spare team; with rescue apparatus, ready for immediate service;
(c) one or more reviving apparatus, oxygen revivers etc,
(d) first aid box and stretcher,
(e) means of testing for carbon monoxide;
(f) a hygrometer; and
(g) two flame safety lamp.

28.Leader:- Every rescue team engaged in work with breathing apparatus in a mine shall be undera leader who shall be appointed by the Superintendent.

30.Test of apparatus:- Before proceeding below ground the leader shall test or witness the testingof self-contained breathing apparatus of the team for leakage.

31.Duties of leader below ground : (1) The leader shall not engage in manual work. He shall givehis attention solely to directing the team and to maintaining its safety. He shall examine the roof andsupports during the journey, and if there is any likelihood of fall at any place along the roadway, shall notproceed further until the team has made the place secure.
When using rescue apparatus, the leader shall carry a watch, shall record the pressure of thecompressed oxygen at intervals of 20 minutes or so, and shall commence the return journey in ample time.
(5).The leader shall not permit any member of the team using breathing apparatus in a mine toremain at work at any one time for a period **longer than one and half hours.**

32.Rescue team members and their duties:- (1) The number of persons in any rescue team usingbreathing apparatus in a mine shall **not be less than five not more than six**, including the leader.
(2)In case there is no provision in any of the breathing apparatus caried by the rescue team for aextension for supply of oxygen to another person inan emergency, the team shall carry a self-rescuer.
(3).Members of rescue team shall in general, use the signals prescribed in Schedule VIII incommunicating to one another.

Miscellaneous

34.Obligation of owner, agent and manager in certain situations:- Whenever emergency arises at abelow ground mine, whether served by a rescue room or rescue station or not, the owner, agent or managermay seek assistance or additional assistance as the case may be from the nearest rescue room or rescuestation and in such an event:-

(a) all possible assistance shall be promptly rendered by the rescue room or rescue station; and
(b) the owner of the mine shall pay to the owner of the rescue station or rescue room, renderingsuch assistance, the full cost of rescue services and facilities borrowed.

35.General management:- It shall be the responsibility of the owner to establish, maintain andensure proper functioning of rescue room or rescue station as required under these rules, to appointSuperintendent, instructors, rescue room incharge, rescue trained persons, and to provide necessary rescueequipment and apparatus as may be necessary for compliance with the provisions of these rules.

36.Inspections:-(2). When the below ground mines served by a rescue station or rescue room fall under thejurisdiction of two or more Regional Inspectors, the Chief Inspector may authorise any one of them forenforcement of these rules.

Form I	-Intimation of appointment etc. of Superintendent.
Form II	- Notice of accident due to rescue apparatus

SCHEDULE I

Equipment to be kept at a Rescue Station

	Nos.
A BREATHING APPARATUS	
1. Two-hours self –contained breathing apparatus	54
2. Short duration self-contained breathing apparatus	06
3. Absorbent charges	2,000
B. RESUSCITATING APPARATUS	
1. Resuscitating Apparatus	12
2. Spare cylinders	8
C.TUBE APPARATUS	
(a)Pressure type with bellows	2
(b)Spare helmets	2
(c)Pressure type with fan	1
D.ANCILLARY EQUIPMENT	
1.Oxygen cylinders	12
2.(a) Oxygen pump (hand driven)	4
(b) Oxygen pump (power driven)	2
3. Bobin meter	3
4. Flow meter	2
5. Universal tester	2
6. Pressure gauge testing device	2
7. Oxygen testing apparatus	1
8. Apparatus testing tool kit	8
E. LAMPS ETC. AND GAS TESTING DEVICE	
1. Flame safety lamps with maintenance kit	8
2.Electric safety lamps	

MULTIPLE CHOICE QUESTIONS

Mine Rescue Rule'1985

1. How many members shall be there in a rescue brigade?
    - a) At most 18
    - b) At least 18
    - c) 6
    - d) 5
2. What is the composition of a rescues station?
    - a) Superintendent only
    - b) Superintendent and one instructor
    - c) Superintendent and two instructor
    - d) Superintendent, at least two instructor & rescue brigade
3. Who appoints the Superintendent of a rescues station?
    - a) Chief Inspector
    - b) Owner
    - c) Agent
    - d) Regional inspector
4. In which of the following case owner appoints another superintendent?
    - a) When superintendent absent exceeds 60 days
    - b) When superintendent absent exceeds 6 months
    - c) When superintendent absent exceeds 30 days
    - d) When superintendent absent exceeds 3 months
5. Within how many days of appointment of superintendent of a rescues station owner shall inform CI & RI ?
    - a) 15 days
    - b) 30 days
    - c) Immediately
    - d) 7 days
6. Information regarding appointment of superintendent of a rescues station shall be given in ______________?
    - a) Form II
    - b) Form I
    - c) Form 3
    - d) Form 6
7. Rescue room shall be established at below ground mine where more than________persons are employed & there is no rescue station within____?
    - a) 100, 25km

    - b) 100, 35km
    - c) 150, 35 km
    - d) 5000, 35km
8. What is the required condition for a single rescue room for a group of mines belonging to same owner?

   i. total number of persons of all mine employed belowground does not exceed 5000.

   ii. they all lie within radius of 35km
    - a) I only
    - b) II only
    - c) I or II
    - d) I & II
9. Which of the following is not the function of rescue room?
    - a) To provide initial training in rescue work
    - b) Provide facilities for storage of breathing apparatus
    - c) Provide facilities for assembly of breathing apparatus
    - d) Provide facilities for testing of breathing apparatus
10. What is the term of posting of a Rescue trained person at rescue station?
    - a) 2 year
    - b) 3 year
    - c) Not less than 1 year and not more than 5 year
    - d) More than 5 year
11. Equipments at rescue room shall be kept according to _________ of mine rules'1985.
    - a) Schedule I
    - b) Schedule II
    - c) Schedule III
    - d) Schedule IV
12. At a belowground mine where there is no rescue room, apparatus & equipment & apparatus shall be kept at the entrance of mine according to _________.
    - a) Schedule I
    - b) Schedule II
    - c) Schedule III
    - d) Schedule IV
13. All breathing apparatus shall be tested in manner as laid down in _________.
    - a) Schedule I
    - b) Schedule II
    - c) Schedule III
    - d) Schedule IV

14. Report of accident arising due to use of rescue apparatus in mine shall be given to ________.
- a) RI
- b) CI
- c) Superintendent
- d) RI & CI

15. Report of accident arising due to use of rescue apparatus in mine shall be given to RI & CI in ________.
- a) Form II
- b) Form I
- c) Form 3
- d) Form 6

16. Report of accident arising due to use of rescue apparatus in mine shall be given to RI & CI within________.
- a) 7 days
- b) 24 hours
- c) Immediately
- d) 72 hours

17. In case of accident arising due to use of rescue apparatus in mine, report has to be sent to CI & RI by ________.
- a) Manager
- b) Rescue room incharge
- c) Superintendent
- d) Person using apparatus

18. How many rescue tracing shall be kept in a mine?
- a) 3
- b) 1
- c) 2
- d) None

19. Rescue tracing shall show________________
- a) General direction of air current
- b) Ventilation door stopping
- c) Booster fan location
- d) All

20. Rescue trained person shall be available at surface at any time when more than ________ are employed belowground.
- a) 100
- b) 150
- c) 500
- d) 50

21. There are 700 persons employed in belowground mine. How many rescue trained person shall be there?
- a) 5
- b) 6
- c) 7
- d) 8

22. Every rescue trained person shall be medically re-examined once at least in every________.
- a) 6 months
- b) 3 year
- c) 5 year
- d) 12months

23. Number of person in any rescue team using breathing apparatus in a mine shall not be ____________ including leader.
- a) Less than 5 & not more than 6
- b) Less than 1 & not more than 5
- c) Less than 5 & not more than 7
- d) Less than 1 & not more than 6

24. Members of rescue team shall use the signals as prescribed in ________ for communication during rescue operation.
- a) Schedule V
- b) Schedule VI
- c) Schedule VII
- d) Schedule VIII

25. When a belowground mine served by rescue station fall under the jurisdiction of more than RI, then who may authorize RI for that rescue station?
- a) CI
- b) Owner
- c) Committee
- d) Central government

Match the following

26. With respect to qualification of superintendent , instructor & rescue room incharge. Match the following.

Person		Qualification	
p.	Superintendent	i.	3 year of belowground experience
q.	Instructor	ii.	5 year of belowground experience
r.	Rescue room incharge	iii.	Rescue trained person

a) P-ii,iii;q-ii,iii;r-iii
b) P-ii,iii;q-ii,iii;r-ii,iii
c) P-i,iii;q-ii,iii;r-ii,iii
d) P-ii,iii;q-iii,iii;r-iii

27. As per Mine Rules'1985 match the following

Schedule			Description
p.	Schedule I	i.	Equipment at mine not having rescue room
q.	Schedule II	ii.	Equipment in rescue station
r.	Schedule III	iii.	Equipment in rescue room
s.	Schedule IV	iv.	Process of testing breathing apparatus

a) p-iii;q-ii;r-i;s-iv
b) p-ii;q-iii;r-i;s-iv
c) p-iii;q-ii;r-iv;s-i
d) p-ii;q-i;r-iii;s-iv

Answers

1.b 2.d. 3.b 4.a 5.d 6.b 7.b 8.c 9.a 10.c 11b 12.c 13.d
14.d 15.a 16.b 17.a 18.d 19.d 20.a 21.c 22.d 23.a 24.d 25.a
26.c 27.b

Mines Vocational Training Rules, 1966

PERSONS TO BE TRAINED

3.Application of Rules -(1) These rules shall apply to all persons employed in a mine, otherthan the persons specified herein, namely :

(a) Persons employed or to be employed for the purpose of saving life or property or dealingwith circumstances arising out of an accident :

(b) Persons holding positions enumerated below being persons employed in a confidentialcapacity or in a position of supervision or a management ;

(i) manager, under manager, under ground manager, assistant manager, ventilation officer and safety officer

(ii) mining, electrical and mechanical engineer;

(iii) overman, foreman, sirdar and mate;

(iv) mechanical and electrical foreman and electrical supervisor

(v) Surveyor and assistant surveyor;

(vi) medical officer, chemist, assayer, metallurgist and welfare or personnel officer; and

(vii) any other person who, in the opinion of the Chief Inspector, holds a position ofsupervision or management by whatever name called.

(c) Shortfirer and blasters.

(d) Clerk, accountants and register keepers.

(e) Persons who have undergone a course of training which is part of study at an institutionapproved by the Central Government in this behalf.

(f) Apprentice mechanics or apprentice electricians, if they have undergone an approvedcourse of training at a mine mechanisation center or other institution approved by the Chief Inspector in this behalf.

General Vocational Training.

6. Scope and Standard - (1) Every person proposed to be employed in mine on the surface orin opencast workings (other than a person who has held any such previous employment)shall, before he is employed, undergo a course of technical and gallery training as specifiedin the **First Schedule** , before he is soemployed, shall undergo a further course of practical training on actual operations for a period of **not less than six working days.**

(2) Every person proposed to be employed **belowground in a mine,** (other than a person whohas held any such previous employment) shall, before he is so employed, undergo -

(a) a course of theoretical and gallery training and gallery training as specified in theSecond Schedule, and

(b) a course of practical training on actual operations for a period of **not less than twelve working days**

A person proposed to be employed in gassy mine shall, before he is so employed,undergo a **further** course of training about the danger of inflammable gas and methods of dealingwith the same as specified in the **Third Schedule.**

REFRESHER TRAINING

8. Scope and standard - Wherever a person returns to employment on the surface or inopencast working or to employment belowground in a mine, after an absence from work for aperiod exceeding **one year** he shall, within **one month** of his joining duty, undergo refreshertraining as detailed in the **Fourth Schedule**, which shall include a minimum of -

(1) **Three safety lecture** and demonstration in the case of persons working on the surface orin opencast workings;

(2) **Six safety lectures** and demonstrations **in addition** to the training specified in clause (1) inthe case of persons working belowground in a non-gassy mine;

(3) **Six further lectures** and demonstrations about the danger of inflammable gas andmethods of ling with the same, **in addition** to the training specified in clause (1) and (2) inthe case of persons working belowground gassy mine.

TRAINING OF SPECIAL CATEGORIES OF EMPLOYEES

12. Training of timber Mistry - Every person who:

(i) is newly employed as timber mistry in a mine, or

(ii) has not worked as a timber mistry in a mine for a period of six months immediatelypreceding his employment or re-employment , undergo a course of training in timber asspecified in the **Fifth Schedule, in addition** to the course of training specified underChapter- III or Chapter IV as may be applicable to him.

13. Training of persons in handling of explosives - (1) Every person other than a qualifiedshortfirer or blaster who is likely to be employed on a job which involves handling of explosivesshall , before he is so employed, **in addition** to the course of training specified, under Chapter IIIor Chapter IV as the case may be , undergo a course of training in the handling and use ofexplosives, as detailed in the **Sixth Schedule.** Every person who has undergone the said trainingshall undergo the training again before re-employment if he has not worked in handlingexplosives for a continuous period of six months or more before such re-employment.

14. Training of person on shotfiring - (1) Every person eligible to appear at the Shotfirer'sCertificate of Competency Examination and who intends to appear at the said examination withinthe succeeding three months, shall,, before he appears for

the examination and in addition to thetraining specified in Rule 13 undergo a course of training as detailed in the **Seventh Schedule.**

(2) Notwithstanding anything contained in Rule 3, the training specified in the SeventhSchedule shall also be undergone within one month of employment, or re-employment, as thecase may be, by-

(i) every shotfirer or blaster on employment in an another mine except in case where hehas already undergone such training and

(ii) every person who though qualified to fire shots has not worked as a shortfirer for acontinuous period of six months or more, on re-employment as a shotfirer.

17. Periodical training in gas testing- Every person holding a gas testing shall once in everyyear, person eligible to appear at the Gas-testing Certificate Examinations and who intends toappear at the examination within the succeeding three months, shall before he appears for theexamination, undergo a course of training as detailed in the **8th Schedule.** The training under thisrule shall be so arranged that the persons concerned can attend the same either before after theirnormal working hours.

TRAINING CENTRES AND ARRANGEMENTS FOR TRAINING.

18. Training Centre: - The owner, agent or manager of every mine shall provide and maintain atraining centre .

20. Training Officer: - (1) Every training centre shall be placed under the charge whole time or part time of a Training Officer as may be specified by the Chief Inspector.

where the Training Officer is unable toperform his duties due to any reason the owner, agent ormanager, as the case may be, may authorise in writing any other person to act in his place.

The authority to act as TrainingOfficer shall cease to have effect on the expiry of 30 days from the date of the authorization unless an order in writing has been obtained from the Chief Inspector or the Regional Inspectorfor the continuance of such person beyond the said period.

(4) A written notice of every appointment, discharge, dismissal, resignation or termination serviceof a Training Officer and of the date thereof shall be sent by the owner, agents or manager tothe Chief Inspector and the Regional Inspector within seven days from the date of suchappointment, authorization, discharge, dismissal, resignation or termination of service as thecase may be.

21. Duties of Training Officer: - (1) It shall be the duty of the Training Officer: -

(i) to organise and supervise the training of every person undergoing training under himin pursuance of these rules :

(ii) to maintain records of the training given to every person and to furnish weeklyreports to the manager on the progress of the persons undergoing training ;

(iii) to maintain records of the supervision in respect of the practical training on actualoperations referred to in Rule 6 and

(iv) to discharge such other duties as may be necessary for, to proper compliance ofthese rules.

(2) Every Training Officer shall keep a record of his work and shall, at the end of every year,forward to the Chief Inspector, through the owner, agent or manager of the mine concerned asummary of the report of his work during the year.

23. Qualification of trainers: - (1) No person shall function as a trainer unless he has attend notless than six lectures on safety in mines, as may be specified for the purpose and approved bythe Chief inspector.

(2) Trainers shall be selected only amongst the persons, who in the opinion of the owner, agentor manager of the mine, are safety minded, skilled and experienced workmen who have anaptitude for given guidance and practical training to other persons

Duration Of Training For Different Categories

	Days for Theoretical Talk	Days for Job Training	Days for Special Points	Total Days
Ventilation bratticing Gang, Fan attendants	5	2	2	9
Track layers,installation-maintenance of machinery, GeneralMazdoor,Haulage/Conveyor attendants, Cleaning/wetting/Stone dusting/stone dust barrier,watering gang,stowing,pick miner,trammer,loader,crane operator,store/material handling	5	5	2	12
Coal cutting & Drilling Crew,Tyndals,drill operator, Fitter Helper	5	11	2	18
Dozer/Pay loader, Dumper Operator, Shovel Operator, Welder/gas cutter	5	16	3	24
Fitter/Electricians etc	7	16	3	26

(Cir. Legis4/1975)

Number of Classes in Schedules

FIRST SCHEDULE
SECOND SCHEDULE
THIRD SCHEDULE 6 days
FOURTH SCHEDULE 6 days
Course for Refresher Training. 6 days

(Each talk to be followed by discussion. Duration of each talk and discussion to be not less thantwo hours)

1. For Surface/ Opencast Workings 3 lecture
2. Additional for underground workers. 6 lecture
3. Additional for gassy underground mine 6 lecture

FIFTH SCHEDULE 6 days
SIXTH SCHEDULE 6 lectures
SEVENTH SCHEDULE 12 lectures
EIGHT SCHEDULE 6 lectures

Form A - Certificate of Training for employment in a mine on surface and in opencast working/belowground in non-gassy mine.

Form B - Certificate of refresher Training /Training of special categories of workmen.

FMC Exam '15

In which form refresher training certificate is given ?

a. Form A
b. Form B
c. Form C
d. Form D
e. Form IV

Ans : (b) Form B

MULTIPLE CHOICE QUESTIONS

Mines Vocational Training Rules 1966

1. Under which schedule of VTC rule training of a person to be employed in a mine should be carried out?
   a) First Schedule
   b) Second Schedule
   c) Third Schedule
   d) Fourth Schedule
2. How many safety lecture a person working below ground in a non-gassy mine must attend after his returning to duty from an absenteeism of 2 year.
   a) Three
   b) Nine
   c) Six
   d) Fifteen
3. Within how many days, a person who joins his duty after being absent from work for 2 years be given refresher training?
   a) 7 days
   b) 14 days
   c) 15 days
   d) 1 month
4. In which Form of VTC rule certificated of refresher training be issued?
   a) Form A
   b) Form B
   c) Form C
   d) Form 5
5. How many days of theoretical refresher training shall a drill operator undergo?
   a) 10 days
   b) 11 days
   c) 12days
   d) 5days

Answers

1.b 2.b 3.d 4.b 5.d

CEA Regulations 2010

The Philosophy of Electricity Rules is to avoid :

1. The situation of a man getting electric shock/burn.
2. Fire from electricity
3. Prevent explosion in mine.

Definition of some important terms:

- **Open sparking**- Sparking which can cause ignition of inflammable gas external to the apparatus.
- **Intrinsically safe apparatus** or circuit-apparatus or circuit in which any spark or any thermal effect produced under normal operation or fault condition, is not capable of causing ignition of a given explosive atmosphere
- **Flameproof flame apparatus** – Flame proof apparatus means an apparatus that can withstand without injury any explosion of the inflammable gas that may occur within it and can prevent the transmission of flame such as will ignite the inflammable gas which may be present in the surrounding atmosphere;
- **Increased safety type 'e'**- is a method of protection for apparatus that don't produce arcs or sparks in normal service.In this method , additional measures are applied to give increased security against excessive temperatures and possibility of occurrence of arcs and sparks.
- **Portable apparatus**- An apparatus which can be moved while in operation.
  e.g.- electric shovel, cutting machine.
- **Transportable apparatus**- An apparatus which is capable of being moved readily from one place to another but cannot be moved while in operation.
  e.g.- pump, auxiliary fan/
- **Cut out**- Any appliance for automatically interrupting the transmission of electricity through the conductor when the current rises above a predetermined amount , and shall also include fusible cut-out.

Voltage

Low	Medium	High	Extra high
Upto 250 V	Over 250 V & Upto 650 V	Over 650 V & upto 33 kV	Over 33 kV

Maximum voltage at which electricity can be transmitted in a mine (belowground or in a quarry of opencast mine) is **11kV** and it can be used at a voltage **upto 6.6kV** even in underground mines.

Instrument	Permissible Limit
Hand held portable apparatus	125 V
Electric lighting system in Underground- Surface of mine or in opencast mine	125 V 250 V
Portable hand lamp	30 V
Remote control or electric interlocking circuit , electrical signaling	30 V
For fixed plants , if bolted type plug is used	650 V
Haulage by electric locomotives on overhead trolley-wire system	650 V

FMC Exam'14

What is the Voltage limit of hand held portable apparatus?

a. 30V

b. 25V

c. 125V

d. 250V

e. 9V

Ans: (c) 125V

Reg. 30 Periodical inspection & testing of installation

Periodic inspection and testing of consumer's electrical installation is to be conducted (at intervals not exceeding 5 years) by the Electrical Inspector or by the supplier as may be directed by the Central Govt. The supplier shall give a report to the consumer with a copy to the Electrical Inspector. Supplier's installation of voltage over 650 V shall be inspected/tested by the Electrical Inspector (at intervals not exceeding 5 years)

"supplier" means an individual, association of individuals, company or institution who supplies a technology, machinery, plant, equipment, appliance or substance for use in coal mines;

Reg. 31 & 33. Tests

Before connecting a consumer's installation for a new or additional supply, and before giving supply, the supplier shall inspect, test applicant's installation. Supply shall not be connected unless:

i) Circuit: Minimum insulation resistance between each live wire and earth is as given below :

Installation of **less than 650 V**	**1 Mega-ohm** when pressure of 500 V DC is applied for 1 minute
Installation of **over 650 V**	**5 Mega-ohm** when pressure of 2500 V DC is applied for 1 minute

Testing equipment and instruments

At mine level

1. 'Megger' type insulation tester upto 1000 volts.
2. Tongue tester
3. Voltmeter and
4. Feeler gauges to test flange gap of FLP apparatus

At Area level

1. H.T. Megger upto 5000 volts
2. Earth leakage relay testing set
3. Earth resistance testing set
4. Relay testing set
5. Voltmeter and Ammeters of different ranges
6. Transformer oil testing equipment, and
7. Cable fault locator

(Cir 67/1973 & 47/1974)

- Conductors of overhead line shall have a breaking strength of **not less than 350 Kg**, but in case of low voltage and span less than 15m, it shall be not less than 150 Kg.
- **Clearance of Overhead Lines(OH)** above ground where dumpers/ trackless vehicles operate or cross in the mine shall **not be less than 12m.**
- **No blasting** for any purpose shall be done **within 300m** from the boundary **of sub-station** or from the electric supply lines or tower structure of voltage exceeding 650V without permission of the owner of such sub -station, electric

supply line and in case of mining lease hold area, without written permission of the Inspector of Mines.

- When a OH line crosses or approaches each other clearance between the lines shall not be less than 2.4 m in any case.
- OH lines erected over any mine shall be protected with earth guarding whose breaking strength shall not be less than 635 Kg.
- Fire extinguishers for electric fire shall be tested atleast once a year.

Reg. 95 Notices

The following notices/returns shall be sent to the inspector:

- ***Annual returns- on or before 1st February***, giving type and size of apparatus in use.
- ***7 day's*** notice before bringing into use any new installation, giving details of apparatus to be installed and their proposed locations.
- Immediate notice, in case of additions/alterations to existing installation of voltage not exceeding 650V, before they are brought into use.
- Returns/notices are not required for telecommunication or signaling apparatus.

Reg.96 Plans

The electrical plan must show (a) cable route (b) fixed installations such as sub-stations, transformers, haulages, belt conveyors and pumps (c) ventilation circuit showing intake, returns, faces and goaf edges; quantity of air flowing at sub-stations and pumping stations.

Portable and transportable apparatus, and lighting/telecommunication/signalling apparatus and cables for the same need not to be shown on the electrical plan.

Reg. 100 Protective equipment

For safety, appropriate switchgear with necessary protective devices shall be suitably placed in the mine for automatically disconnecting the supply to any part of the system, when a fault, including earth fault, occurs. **Fault current shall not be more than 750 milliamps in installation of over 250 V upto 1100V for underground mines and 50 amps in installations exceeding 1100 V & upto 11kV in OC mines.**

Reg 101. Earthing of metal

All conductors of an earthing system shall have conductivity, at all parts and at all joints, atleast equal to 50% of the largest conductor used to supply the apparatus, a part of which is desired to earth, and cross sectional area shall not be less than 0.15 cm^2. Cross-sectional area and conductors of earth conductor of flexible cable used with portable apparatus of voltage upto 125V shall not be less than that of the largest live conductors in the cable.

Reg. 106 Cables (other than flexible cable for portable and transportable apparatus)

1. Cables other than other than flexible cable for portable and transportable apparatus, shall be (a) covered with insulating material (b) efficiently protected from mechanical damage, and (c) supported at sufficiently frequent intervals.

2.(a) Where voltage exceeds 125V, or where the inspector of Mines considers that there is a risk of igniting gas, coal dust, or other inflammable material and so directs, no cables other than the following shall be used:

(i) concentric cables, or
(ii) 2-core/multicore cables protected by a metallic covering, or
(iii) single core cables protected by a metallic covering which contains all conductors of a circuit.

However, where a D.C. system of voltage over 250V & upto 650V is used, 2 single core cables, protected by metallic covering, may be used for any circuit if their metallic coverings are bonded together by earth conductors, so placed that the distance between any two bonds is not greater than 30m measured along either cable.

3. The metallic covering of every cable shall be-
(i) electrically and mechanically continuous throughout.
(ii) earthed, if required
(iii) protected from corrosion
(iv) of a conductivity, at all parts, and at all joints, atleast equal to 50% of the conductivity of the largest conductor enclosed therein
(v) so constructed to prevent occurrence of open sparking

Reg. 107. Flexible cables.

(1) Flexible cables, for portable and transportable apparatus, shall be two core or multicore type, heavily insulated, and efficiently protected against mechanical injury.

(2) Metallic covering provided to protect the flexible cable from mechanical injury, shall not be used as sole earthing conductor , but may be used for that purpose in conjunction with earthing core.

(3) For machine of over 650V, bolted type connector shall be used, and the trailing cable shall be suitably anchored at the machine end.

(4) If voltage exceeds 250V,

- Flexible cables for transportable apparatus shall be provided with flexible metallic screening or pliable armoring.

- Flexible cables for portable apparatus shall have flexible metallic screening on all the power and pilot cores.

However this shall not apply to flexible cables attached to any transportable or portable apparatus used in opencast or belowground mines if reeling and unreeling of such cable is necessary as per design features of the equipment.

(5) When individually screened cable is used, conductance of each screen shall not be less than 25% of that of the power conductor, and the combined conductance of all screens, shall be not less than $0.15cm^2$ copper conductor.

(6) Length of flexible cable with any portable/transportable apparatus shall **not exceed 100m**.But it may be upto-

250m	when used for longwall operation, with coal cutting machine or cutter loader or armored face conveyor for longwall operation, or with shuttle cars or LHD, or cutter loader alike equipment for development/depillaring operations.
300m	with electricity operated HEMM in openacast mines
1000m	with bucket wheel excavator at 11kV.

(7)Flexible cables shall not be used with apparatus other than portable ortransportable apparatus.

Flexible cables fall into two main categories:

(a) **Trailing cables** used with portable apparatus such as coal cutters, LHDs, SDLs etc.

(b) **Pliable wire armored cables** used with transportable apparatus such as pumps, conveyors, auxiliary fans etc.

110.Precautions where gas exists.

(1)Degree I gassy mines -

(i)all cables shall be constructed, installed, protected, operated and maintained in such a manner as to prevent risk of open sparking;

(ii)all signaling, telecommunication, remote control and insulation tester circuits shall be so constructed, installed, protected, operated and maintained as to be intrinsically safe;

(iii)all apparatus including portable and transportable apparatus including lighting fittings used at any place which lies **in-bye of the last ventilation connection** shall be **flame-proof:**

Provided that electrically operated or battery operated portable or transportable apparatus such as shuttle car, men or material transporting equipment of **increased safety type "e"** shall be permitted at any place with suitable gas monitoring devices

(iv)all electric lamps at any place which lie in-bye of the last ventilation connection and return airways shall be in flame proof enclosure and at other places these shall be in increased safety enclosure type 'e'.

(2) Degree II & Deg. III gassy mines

(i) all signaling, telecommunication, remote control and insulation tester circuits shall be so constructed, installed, protected, operated and maintained as to be **intrinsically safe;**

(ii) all cables shall be constructed, installed, protected, operated and maintained in such a manner as to prevent risk of open sparking;

(iii) all apparatus, including portable and transportable apparatus used at any place **within 90 m** of any working face or goaf in case of a **second degree** gassy mine and within **270m**of any working face or goaf in case of third degree gassy mine or at any place which lies in-bye of the last ventilation connection or in any return airways shall be **flame proof;**

(iv) all electric.lamps shall be enclosed in flame-proof enclosures.

In any part of a coal-seam of any degree of gassiness, if the presence of inflammable gas in the general body of air is found at any time to exceed 1.25%, the supply of energy shall be immediately disconnected from all cables and apparatus in the area.

(Cir. 60/1967)

Whenever there is fire in a Deg. I gassy seam, accumulation of gas at sites of electrical equipment near the fire area shall be systematically checked and if an accumulation in general body of air close to non-FLP equipment is found to exceed 0.5%, all non-FLP equipment shall be forthwith disconnected from supply. Only FLP equipment shall be used in such areas.

(Cir. 38/1973)

Extra Shots

Earth fault is an Open Circuit fault; where the power carrying cable or conductor breaks and gets into contact with earth or a any coundctor capability material in contact with earth. System at load end in this case is disconnected form source in in case of radial power flow.

Earth Leakage current is the current that flows through the protective ground conductor to ground due to insulation failure of cable.

$$\text{Power Factor} = \frac{\text{Real power (kW)}}{\text{Apparent Power(kVA)}}$$

Power factor can be corrected by using capacitors.

LOCKOUT means to physically neutralize all energies in a piece of equipment before beginning any maintenance or repair work. Lock out involves stopping all energy flows by turning off switches on supply lines. It also involves locking physically the switches and securing the machine, device or supply lines in a de-energised state.

TAGOUT means placing a warning tag or sign (TAGOUT device) on an energy isolating device, warning not to operate the machinery until the TAGOUT device is removed. The purpose is to alert other employees about the status of a machine or a system, why it has been taken out of service and Identity of the individual who has applied the LOCKOUT.

MULTIPLE CHOICE QUESTIONS

CEA Regulations 2010

1. Which among the following will be considered to be extra high voltage?
   a) 11kV
   b) 6kV
   c) 50kV
   d) 32kV
2. What is the maximum voltage that can be transmitted to a belowground mine?
   a) 6.6kV
   b) 11kV
   c) 250V
   d) 650V
3. At a belowground mine electricity can be used at voltage upto ______
   a) 6.6kV
   b) 11kV
   c) 250V
   d) 650V
4. What is the permissible limit of voltage for using hand held apparatus?
   a) 125V
   b) 30V
   c) 25V
   d) 250V
5. What is the permissible limit of voltage for using portable hand lamp ?
   a) 125V
   b) 30V
   c) 25V
   d) 250V
6. What should be the minimum insulation resistance between a wire operating at 500 volatage & earth ?
   a) ·10 mega Ω
   b) 5 mega Ω
   c) 1 Ω
   d) 1mega Ω
7. What should be the breaking strength of overhead conducting line wire?
   a) 350 Kg
   b) 100Kg
   c) 200Kg
   d) 250Kg

8. What should be the minimum clearance of overhead lines above ground where dumpers are in operation ?
   - a) 30 m
   - b) 20 m
   - c) 15m
   - d) 12 m

9. Fire extinguisher used for electrical fire shall be tested at least once in a ______
   - a) Every six month
   - b) 3 month
   - c) A year
   - d) A month

10. No blasting for any purpose shall be done within____________ of boundary of substation.
    - a) 300m
    - b) 500m
    - c) 100m
    - d) 50m

11. What should be the minimum clearance between two overhead line where they cross each other?
    - a) 3 m
    - b) 12 m
    - c) 2.4 m
    - d) 1.5 m

12. How many days of prior notice has to be given to inspector before installing new electrical apparatus?
    - a) 14 days
    - b) 7 days
    - c) 15 days
    - d) Immediately

13. Which among the following shall not be shown in electrical plan ?
    - a) Cable route
    - b) Portable apparatus
    - c) Belt conveyor
    - d) Ventilation

14. In case of open cast mine fault current shall not be more than ____________-- where electrical apparatus are operating at 6.6kV.
    - a) 750A
    - b) 50mA
    - c) 750mA

    - d) 50A

15. What can be the maximum length of flexible cable for using LHD?
    - a) 100 m
    - b) 90 m
    - c) 250 m
    - d) 300 m

16. What can be the maximum length of flexible cable for bucket wheel excavator operating at 11kV?
    - a) 300 m
    - b) 250 m
    - c) 2000 m
    - d) 1000 m

17. In case of mine supply of electrical energy shall be cut off immediately when the % of air in general body of air exceeds____________.
    - a) 0.5
    - b) 0.75
    - c) 1
    - d) 1.25

18. In case of fire in first degree gassy mine electrical supply for all non-flameproof apparatus shall be cut off when % of inflammable gas exceeds____
    - a) 0.5
    - b) 0.75
    - c) 1
    - d) 1.25

19. In case of deg II mine all apparatus shall be flameproof within______________ of any working face.
    - a) 100 m
    - b) 90 m
    - c) 300 m
    - d) 270 m

20. In case of deg III mine all apparatus shall be flameproof within______________ of any working face.
    - e) 100 m
    - f) 90 m
    - g) 300 m
    - h) 270 m

Match the Following

21. As per CEA regulation 2010 match the voltage with the category in which they fall

	Voltage		Category
	30 V	I	Extra high
Q	6500V	II	High
R	650V	III	Medium
S	50kV	IV	Low

a) P-I,Q-II,R-III,S-IV
b) P-III,Q-II,R-I,S-IV
c) P-IV,Q-II,R-III,S-I
d) P-II,Q-IV,R-III,S-I

22. As per CEA regulation 2010 match the instrument/apparatus with their permissible operating voltage.

	Instrument		Permissible voltage
P	Portable hand lamp	I	125V
Q	Hand held apparatus	II	30V
R	Underground Lighting system	III	250 V
S	Opencast lighting system	IV	650V

a) P-II,Q-I,R-I,S-IV
b) P-II,Q-I,R-III,S-IV
c) P-I,Q-II,R-I,S-III
d) P-II,Q-I,R-I,S-III

Answers

1.c 2.b 3.a 4.a 5.b 6.d 7.a 8.d 9.c 10.a 11.c 12.b 13.b 14.d 15.c 16.d 17.d 18.a 19.b 20.d 21.c 22.d

GENERAL SAFETY

Severity Index

Severity Index is a index which gives the information whether a mine is "Accident prone" or not.

$$\text{Severity Index} = \frac{50F + S}{\text{Man shift worked}} \times 100000$$

Where, F= number of Fatality

S= Number of serious injury'

If the Severity Index is more than 12, then that mine shall be called as "accident prone" otherwise "Non-accident Prone".

Frequency Rate

1. On the basis of production

$$= \frac{\text{Number of persons involved in accident}}{\text{Coal production in million tonne}}$$

2. On the basis of employment

$$= \frac{\text{Number of persons involved in accident}}{\text{Total number of persons employed}} \times 1000$$

TRAP (take responsibility in accident prevention)

TRAP is a pro-active program. This program is an employee-driven program that involves the worker, the supervisor, management in identifying, evaluating, and eliminating hazards in workplace.

The emphasis of this program is not on analyzing accidents which have already happened, but on capturing near-miss information or identifying existing traps which have not produced injury or lost time events.

Purpose- purpose of this program is to encourage employees to report near-miss situations or existing "traps" along with helping management find reasonable and economical solutions to problems.

Goal- main goal of TARP is to make the workplace safer for everyone.

The key to the program success is to get the miners involved.

Mine Gases and their Physiological Effects

Time-weighted average(TLV-TWA)- It refers to the average concentration to which a worker is exposed over the course of a work week. It is calculated on the basis of a 40-hour week.

Ceiling Concentration (TLV-C)- These are the maximum concentration that should not be exceeded even instantaneously.

1. **Carbon Monoxide**

   Limits:

   TLV –50ppm or 0.005 %

   Ceiling – 200 PPM

   Explosive Range:- 12.5% to 74%

   Source - Carbon monoxide results from incomplete combustion of organic carbon-based materials. The principal causes of its formation are mine fires and coal dust explosion.

Physiological effects of CO poisoning

CO concentration (PPM)	Symptoms
200	Slight headache, tiredness, dizziness, nausea after 2 to 3 hrs
400	Frontal headache within 1 to 2 hrs., life threatening after 3 hrs.
800	Dizziness, nausea and convulsions within 45 minutes. Unconsciousness within 2 hours. Death in 2 to 3 hours.
1600	Headache, dizziness, nausea within 20 minutes. Death within 1 hour.
3200	Headache, dizziness, and nausea within 5 to 10 minutes. Death within 30 minutes.
6400	Headache, dizziness, and nausea within 1 to 2 minutes. Death within 10 to 15 minutes.

2. **Carbon Dioxide**

   Limit

   TLV- 5000 ppm or 0.5 %

   Ceiling- 1.5%

   Source- Main source of CO_2 in mine are mine fires, explosion, slow oxidation of coal , timber, burning of flames, breathing of persons.

Physiological effects of carbon dioxide

CO_2 Conc.	Effects
0.5%	Breathing becomes little deeper and faster
2%	Rate and depth of breathing increases by 50%
4%	Breathing becomes much faster, about three times
8-10%	After half to one hour of hour, suffocation and unconsciousness occur
20%	Death occurs after 20 to 30minute of breathing

3. **Hydrogen Sulphide (H_2S)**

   Limits:

   TLV – 10 PPM

   Ceiling – 15 PPM

   Explosive Range: 4.3% to 46%

   Source- Source of Hydrogen sulphide in mine are heating of coal containing sulphur, decay of timber, action of acidic mine water on sulphides, emission from water of mineral springs when intersected etc.

Physiological effects of Hydrogen Sulphide (H_2S)

H_2S Conc.	Effects
0.005-0.01	Mild conjunctivitis and respiratory tract irritation after one houe exposure
0.02-0.03	Marked conjunctivitis and respiratory tract irritation after one-hour exposure
0.05-0.07	Dangerous after half to one hour exposure
0.07-0.20	Rapid unconsciousness, cessation of respiration and death in few minutes at the higher concentration

4. **Sulphur Dioxide (SO_2)**

   Limits:

   TLV – 5 PPM

   Ceiling – 10 PPM

5. Nitrous Fumes (NO_x)

   Permissible Limit – 5 ppm

6. Hydrogen(H_2)

   Explosive Range:-4.1% to 74%

Atmospheric Air Constituent

Constituent	% Volume
Oxygen	20.93
Nitrogen	79.04
Carbon Dioxide	0.03

Mine Gas Mixtures

a. Black Damp/Chokedamp – mixture of CO_2 and excess nitrogen.
b. Firedamp – methane or trace amount of other gases.
c. Whitedamp- Carbon monoxide
d. Afterdamp- residual gaseous products and smoke after a major fire or explosion.
e. Stinkdamp- hydrogen sulphide (H_2S)

FMC Exam'14

What is the permissible limit of CO in mine air?

a. 30 ppm
b. 50 ppm
c. 10 ppm
d. 5000ppm
e. 2000ppm

Ans: (b) 50 ppm

Resuscitation or Artificial Ventilation

Resuscitation is the process of inducing artificial respiration in a person who is unconscious and whose rate of breathing has become considerably feeble. If immediately the normal gas exchange is not restored by resuscitation then it may lead to death.

Resuscitation operation must be continued after it is once started until natural breathing is restored or till such time as the doctors decide that the further efforts will be of no avail. There are many accidents in mines which require resuscitation operation. The principle causes of such accidents are:

a. Inhalation oxygen-deficient atmosphere.
b. Inhalation of toxic gases.
c. Electric shock

Resuscitator Apparatus

a. Draeger pulmotor
b. Siebe Gorman Maxaman Resuscitator

Reviving Apparatus

A reviving apparatus is used to administer pure oxygen (a) to an unconscious person (b) to one who is affected by noxious gases or (c) to one whose breathing is considerably feeble for some other cause.

Depending on the method of oxygen supply,the inhalators can be divided into two main groups:

a. Inhalators with constant dosage.
b. Inhalators with lung-governed dosage.

Important Recommendations of National Safety onferences

RECOMMENDATIONS OF THE FIRST CONFERENCE ON SAFETY IN MINES

(Held in Calcutta on 5th-6th August, 1958)

1. Lamps issued to overmen and superior officials should be relighter type.
2. A Water Danger Plan should be prepared in respect of all underground workings showing all reservoirs of water lying within 60m of any workings.
3. A suitably qualified persons should be employed as Safety Officer.
4. A Safety Committee should be set up to discuss matters relating to safety.
5. 'First Aid Training' amongst mine workers should be intensified.

RECOMMENDATIONS OF THE SECOND CONFERENCE ON SAFETY IN MINES

(Held in Calcutta on 9th-10th July, 1966)

1. Provision of safety lamps
2. Installation of mechanical ventilators

RECOMMENDATIONS OF THE THIRD CONFERENCE ON SAFETY IN MINES

(Held in Calcutta on 14th-15th July, 1973)

1. Vocational training to workers should be imparted during the working hours.
2. Occupational Health Service at Company level should be established.

RECMMENDATIONS OF THE FOURTH CONFRRRNCE ON SAFETY IN MINES

(Held in Calcutta on 24th Decembe1,1978)

1. Mine management should develop their own Internal Safety organisation
2. New strategies should be planned to achieve the goal of reaching Zero Accident Potential (ZAP).

RECOMMENDAITONS OF FIFTH CONFERENCE ON SAFETY IN MINES

(Held in New Delhi on 26-27 December, 1980)

1. **Tripartite meeting** consisting of the **management, trade union and the DGMS** should be arranged at intervals not exceeding 6 months during which the safety performance and progress of implementation of Company's policy on safety and Health and of the recommendations of this Conference and of different courts of inquiry should be discussed. These meetings could be presided over by representatives of management, labour and DGMS by rotation.

Extra Shots

Tripartite Meeting is held at corporate level at every 6 months

Bipartite Committeeconsists of the management & the Trade Union.

Meeting is held at area level quarterly.

2. **Quality control cell**

   To prevent accidents due to failure of equipment each mining company should have a well equipped quality control cell which should not only ensure the purchase/procurement of good quality equipments/apparatus but should also monitor the performance of the same in actual use. These cells should also lay down schedules for the proper maintenance and operation of such equipments/apparatus .

3. All Degree III gassy mines should have a comprehensive network of environmental monitoring system.
4. Tele-communication system in belowground and opencast mines.
5. **Functions of ISO**

   1.The Internal Safety Organisation (ISO) should be independent of the production line at all levels.

   2. The Chief of ISO should be a senior officer next in rank only to the Director (Tech.) if any or MD/ the Chief Executive.

   3. The ISO should be a multi-disciplinary team and the field setup should start above the; level of mine. The Safety Officer at the mine level being a specialist staff officer to the Mine Manager should not be deemed to be part of the ISO.

   4 . In order that the Internal Safety Organisation is able to play an effective role, detailed guidelines for their functioning may be laid down covering, inter-alia, the following:

   (i) Formulation of safety policy at the corporate level;

   (ii) Effective monitoring of the state of implementation of the policy directives on safety;

   (iii) Periodic inspection of mines for assessing status of safety;

(iv) Enquiry into all accidents and dangerous occurrences;

(v) Actively associated in opening new districts and in obtaining permissions, relaxations and exemptions under the statute;

(vi) The findings of ISO should be placed before the Pit Safety Committee for discussion and dissemination.

RECOMMENDATIONS OF SIXTH CONFERENCE ON SAFETY IN MINES

(Held in New Delhi on 13th & 14th January, 1986)

1. **Accidents due to falls of roof and sides**

   Formulation of '**Support Plan**'

   Manager of every underground mine should formulate 'Support Plan' for support of roof,sides, back and hangwall in consultation with strata control cell where set up, CMPDIL/any technical or research institution , ISO and safety committee. The 'Support Plan' should be in respect of the following :

a) Working within 9 meters of working faces.
b) Along tramming levels and specially at loading points
c) Along haulage roadways and specially at junctions
d) At any other place(s) in the mine identified for support under Reg. 108 of CMR 2017.

Local geological conditions, physico-mechanical properties of strata , method of work including mechanization and past experience etc. may be taken into account while formulating such plan.

The plan should include:

a) Type of supports e.g. safari supports, roof bolts, friction props, rigid props or hydraulic props etc.
b) Duties and responsibilities of Timbermen, dressers, sirdars/mates, overman/foreman,assistant managers/managers and agents towards supply of material, erection and withdrawal of supports, inspection thereof and ensuring effectiveness of supports.

   The 'Support Plan' should be submitted to DGMS for approval.No person should be employed at any place which is not supported in accordance with the approved 'Support Plan'.

   ISO should investigate each and every major incident of roof and side fall even if it does not involve any casualty.

2. Air borne dust surveys should be carried out on a regular basis.
3. Initial medical examination of all workers employed in underground mines, surface and engaged in drilling, loading and at crushing and screening plants and thereafter, the periodical medical examination of all such workers.

RECOMMENDATIONS OF SEVENTH CONFERENCE ON SAFETY IN MINES

(Held in New Delhi on 19th & 20th Dec., 1988)

1. Framing suitable 'code of traffic rules' for regulating the movement of Heavy Earth Moving Machinery & such Code of Traffic Rules should be approved by Tripartite Committee.
2. **The Occupational Health Services** shall carry out the following functions:
   (i) Identification and assessment of the risk from health hazards at work place;
   (ii) Surveillance of the factors in working environment and work practices which may affect workers' health;
   (iii) Surveillance of workers' health in relation to work;
   (iv) Education of workers on sanitation, cleanliness, hygiene and health care;
   (v) Collaborating in providing information, training and education in the fields of occupational health, industrial hygiene and ergonomics;
   (vi) Organisation of first-aid in mines including training and retraining of first-aiders;
   (vii) Preparing a quarterly status report on occupational health and industrial hygiene in the mines of the concerned company. The quarterly report should include information on medical examinations, notifiable diseases, status of first-aid, results of survey for air-borne dust, noise, temperature, quantity of air and sanitation in working places;
   (viii) The report of medical examination of each worker should be maintained regularly and the record of periodical medical examinations should be maintained systematically. Application of computer for storing and retrieval of data would be desirable;
   (ix) Advising the management on occupational health, industrial hygiene, first-aid, ergonomics.The Occupational Health Services shall be headed by a Senior Officer. Occupational Health Physician should be a member of the Safety Committee where he could contribute to the health education of workers.

RECOMMENDATIONS OF EIGHTH CONFERENCE ON SAFETY IN MINES

(Held in New Delhi on 14th May, 1993)

1. Training for front-line supervisory officials.
2. Audiometry should be introduced where noise level exceeds 90 dB (A).
3. Trucks and other heavy vehicles, not belonging to management should not be allowed in the mine premises without a valid pass issued.

RECOMMENDATIONS OF NINTH CONFERENCE ON SAFETY IN MINES

(Held on 2nd-3rd February, 2000 at New Delhi)

1. Quality Control set up for Improving Safety.
2. Occupational Health Surveillance in mining industry.
3. Risk management plan shall be prepared on the basis of risk assessment.

RECOMMENDATIONS OF THE TENTH CONFERENCE ON SAFETY IN MINES

(HELD ON 26th AND 27th November 2007, AT NEW DELHI)

Contractor work vis-à-vis Safety

1. Employer's responsibilities

(a) Suitable clauses shall be included in tenderdocument (including NITs) stating how the risk arising to men & material from the mining operation / operations to be done by the contractors shall be managed.

(b) Ensure that contractors are familiar with the relevant parts of the statute, health and safetymanagement system .

(c) Ensure that contractor's arrangements for health and safety management are consistent withthose for the mine owner. All the rules, regulations and bye-laws as applicable to the mine ownerare also applicable to the contractor. Details of the contractors' workmen should be maintained inthe owner's Form-B Register. Whereas, C, D & E Registers for contractor men may be maintainedindependently by the owner.

(d) Ensure that contracts should preferably be of longer period (three years), so that there isadequate scope of management of safety by the contractor.

(e) Ensure that contractor's provide the machinery, operator and other staff with written safe workprocedures for the work to be carried out, stating clearly the risk involved and how it is to bemanaged.

(f) Monitor all activities of the contractors to ensure that contractors are complying with all therequirements of statute and the system related to safety. If found non-compliant of safety lawsdirecting the contractor to take action to comply with the requirements, and for further noncompliance,the contractor may be suitably penalized..

(g) Where a risk to health or safety of a person arises because of a non-compliance directing thecontractor to cease work until the non-compliance is corrected.

2. Contractor's responsibilities

(a) Prepare written Safe Operating Procedure (SOP) for the work to be carried out, including an assessment of risk.

(b) Provide a copy of the SOP to the person designated by the mine owner who shall besupervising the contractor's work.

(c) Keep an up to date SOP and provide a copy of changes to a person designated by the mineowner.

(d) Ensure that all work is carried out in accordance with the Statute and SOP and for the purposehe may deploy adequate qualified and competent personnel for the purpose of carrying out the jobin a safe manner.

(e) For work of a specified scope/nature, develop and provide to the mine owner a site specificcode of practice.

(f) All persons deployed by the contractor for working in a mine must undergo vocational training,initial medical examination, PME. They should be issued cards stating the name of the contractorand the work and its validity period, indicating status of VT & IME.

(g) Every person deployed by the contractor in a mine must wear safety gadgets to be providedby the contractor. If contractor is unable to provide,owner/agent /manger of the mine shall providethe same.

(h) The contractor shall submit to DGMS returns indicating – Name of his firm, Registrationnumber, Name and address of person heading the firm, Nature of work, type of deployment ofwork persons, Number of work persons deployed, how many work persons hold VT Certificate,how many work persons undergone IME and type of medical coverage given to the work persons.

The return shall be submitted quarterly (by 10th of April, July, October & January) for contracts ofmore than one year. However, for contracts of less than one year, returns shall be submittedmonthly.

3.Occupational Health Surveillance and Notified Diseases.

a. Noise mapping should be made mandatory of various work places in the mine premises based on the various machines being used in concerned mines along with personal noise dosimetry of individual workmen exposed to noise level above 85 db(A).

b. Vibration studies of various mining machinery required to be done before their introduction in mining operations as per ISO standards.

c. Ergonomical assessment of all latest machines, before their introduction into mining
operation as per ISO standards. Ergonomical assessment should include:
  - Assessment of work process.
  - Assessment of working Aids/tools
  - Assessment of working posture

d. Potability tests of drinking water supplied to the mine employees, to be made mandatory once in a year irrespective of its source, preferably after Rainy seasons, the sample of water should be collected from the points of consumption

e. Initial medical examination shall be made mandatory for all mining employees whether permanent, temporary or contractual, before they are engaged in any mining job.

f. *The frequency of periodic medical examinations should be brought down from existing five years to three years for the mining employees above 45 years of age.*

4. *To* phase-out manual loading.
5. *Establish* STRATA CONTROL CELL at corporate and area level.
6. *Belowground* Communication and Tracking System

RECOMMENDATIONS OF THE 11th CONFERENCE ON SAFETY IN MINES

(Held on 4th & 5th July, 2013 at New Delhi)

1. Focused on small scale mining.
2. Surface and Underground Transportation Machinery:
   (a) Mine Planning & Design The provisions of requirements of HEMMs and their installations, operations, maintenance and training shall be included in the project at planning stage.
   (b) (i) Audio-Visual Alarm -The sound level of AVA should be at least 5 to 20% higher than the ambient noise level;
   (c) AVA should be of IP 67 compliance.

   Extra Shots

   Meaning of IP67- **IP** stands for 'Ingress Protection' 6 stands for- **Totally protected against dust**

   7 stands for - Protected against the effect of immersion between 15cm and 1m

   (d) GPS-GSM Based Navigation System
3. Transportation machineryin underground:-

(a) All steam winders should be replaced with electric winders.

(b) Man-Riding System

(c) Use of Diesel Equipment belowground in Coal Mine.

4. Safety , Health and welfare of contractual workers.

Extra Shots

MAN RIDING HAULAGE SYSTEM FOR TRANSPORTATION OF PERSONS IN MINES

GENERAL REQUIREMENTS

Route and Profile of the Roadway

a) The axis of the rail line in its position shall be straight. However, horizontal deviations, if any, of the travel may be permitted such as to maintain minimum radius of 15m required to negotiate Man Riding Car.

b) The Man Riding System with Endless Haulage shall not run in a steeper gradient more than 1:12. However steeper gradient is allowed at pit mouth area where the distance shall not exceed 200 m.

c) The Cars shall be capable of passing over rail track with 610 mm gauge minimum.

d) In order to ensure free movement of passengers, the following distances shall be provided and ensured:
   a) Below the roof shall not be less than 0.3 m after duly considering the undulations, if any.
   b) Irrespective of the Man Holes that were provided, if any, the clearance from the edge of the Man Riding Car: 0.6 m
   c) Between two Cars that are on adjacent tracks the clearance shall be at least : 0.3 m

e) The height and width of gallery shall not be less than 3.0 m X 3.0 m.

Mechanical Details

Besides statutory and other specific requirements the direct rope haulage for transporting persons in mines shall confirm to the following requirements:

a) Drum diameter in mm : minimum 80 times of rope diameter.

b) Drum width in mm : minimum 60 times the rope diameter.

c) Flanges diameter in mm : minimum 100 times the rope diameter.

d) Rope capacity on drum : up to 2000m

Maximum Speed — The normal working speed of car shall not exceed 8 km/h.

The Man riding capacity for normal height car shall be as mentioned below:

Rope Anchor Car: 24 persons

Man Riding Car: 30 persons

(As per regulations and act and BIS approval)

MULTIPLE CHOICE QUESTIONS

General Safety

Mine Gases

1. The explosive range of methane is ________.
   a) 2% to 10%
   b) 2% to 15%
   c) 5% to 15%
   d) 5% to 10%
2. A flame safety lamp will go out when the oxygen percentage falls below ________.
   a) 19.5%
   b) 17.0%
   c) 16.5%
   d) 16.0%
3. The explosive range of carbon monoxide is ________.
   a) 5% to 15%
   b) 4.5% to 74%
   c) 12.5% to 74%
   d) carbon monoxide is not explosive
4. ________ of carbon monoxide will produce symptoms of unconsciousness in 30 minutes.
   a) 200-300 ppm
   b) 400-600 ppm
   c) 1000-2000 ppm
   d) 2000-3000 ppm
5. Workers should not be employed for a period of 8 hours where the carbon monoxide content exceeds ________.
   a) 50 ppm
   b) 10 ppm
   c) 5 ppm
   d) 100 ppm
6. The least percentage of methane that can be detected with a flame safety lamp is ________.
   a) 0.25%
   b) 0.50%
   c) 1.00%
   d) methane cannot be detected with a flame safety lamp

7. Maximum explosive violence of methane is at ________.
   - a) 5%
   - b) 8%
   - c) 15%
   - d) 10%

8. No explosion of a methane-air mixture can occur if the oxygen level falls below ________.
   - a) 19.5%
   - b) 16.0%
   - c) 14.5%
   - d) 12.0%

9. In a mine environment, methane is most likely to be found ________.
   - a) near the bottom
   - b) near the roof
   - c) in return areas only
   - d) in intake areas only

10. What effect does the presence of methane have upon the explosibility of coal dust?
    - a) The coal dust is ignited less easily.
    - b) The coal dust is more easily ignited and the force of the explosion is greater.
    - c) Methane does not affect the explosibility of coal dust.
    - d) None of the above.

11. Where is methane normally found?
    - a) Since the specific gravity of methahe is .555 which indicates that it is lighter than air, it is normally found in high places.
    - b) Since methane's specific gravity is 0.555, it is normally found in low places.
    - c) Methane is normally found at the working areas of the mine.
    - d) Methane is normally found in abandoned or worked out areas of the mine.

12. What gas is odorless, tasteless, non-toxic, colorless and explosive in the concentration of 5% - 15%?
    - a) Carbon monoxide.
    - b) Oxygen.
    - c) Nitrogen.
    - d) Methane.

13. Which is easier to remove, a body of methane or carbon dioxide?
    - a) Methane would be the easiest to remove because it is lighter than carbon dioxide and diffuses more readily.
    - b) Carbon dioxide, as it is heavier than methane and diffuses slowly.
    - c) When the temperature is light, carbon dioxide is the easier to move.

    - d) Methane is easier to remove only when velocity is high.

14. What effect does coal dust in the air have upon the explosibility of methane?
    - a) The lower explosive limit is increased.
    - b) The upper explosive limit is increased.
    - c) The upper explosive limit is increased.
    - d) The lower explosive limit is decreased.

Answers

1.c 2.d 3.c 4.c 5.a 6,c 7.d 8.d 9.b 10.b 11.a 12.d 13.a 14.d

MULTIPLE CHOICE QUESTIONS

General Safety

National Safety Conferences

1. In which National Safety Conference (NSC) need of a safety officer was discussed?
   - a) 1st NSC
   - b) 2ndNSC
   - c) 3rdNSC
   - d) 4thNSC
2. In which National Safety Conference (NSC) formation of safety committee was recommended for a mine ?
   - a) 1st NSC
   - b) 2ndNSC
   - c) 3rdNSC
   - d) 4thNSC
3. In which National Safety Conference (NSC) set up of Internal safety organization(ISO) was recommended ?
   - a) 4th
   - b) 5th
   - c) 6th
   - d) 7th
4. In which National Safety Conference (NSC) need of a quality control cell was discussed?
   - a) 4th
   - b) 5th
   - c) 6th
   - d) 7th
5. Which of the following is not the function of quality control cell?
   - a) Ensuring the quality of purchase equipment
   - b) Monitoring the performance of equipment
   - c) Formulating the schedule of maintenance of equipment
   - d) None
6. Which of the following is not true about the function of ISO ?
   - a) Formulation of safety policy at corporate level
   - b) Periodic inspection of mine for assessing status of safety
   - c) Taking active participation in opening new district
   - d) None

7. According to Sixth National Safety Conference (NSC) support plan should be made in consultation with ______
   - a) Strata control cell
   - b) Safety committee
   - c) ISO
   - d) All
8. In which National Safety Conference (NSC) framing of code of traffic rule was recommended ?
   - a) 6th
   - b) 7th
   - c) 8th
   - d) 9th
9. According to Sixth National Safety Conference (NSC) support plan is formulated for______
   - a) Support of roof
   - b) Overburden dump
   - c) Bench
   - d) Highwall
10. As per 8thNational Safety Conference (NSC) a person engaged in operation where noise level exceeds ____________ shall be provided audiometry.
    - a) 85 dB(A)
    - b) 90dB(A)
    - c) 115dB(A)
    - d) 130dB(A)
11. As per 10thNational Safety Conference (NSC) potability test of water should be done at least once in ________
    - a) Six month
    - b) Every Month
    - c) A year
    - d) Three year
12. As per 10thNational Safety Conference (NSC) noise mapping should be mandatory at work place in mine where noise level exceeds ________.
    - a) 85 dB(A)
    - b) 90dB(A)
    - c) 115dB(A)
    - d) 130dB(A)
13. In which National Safety Conference (NSC) man riding was recommended ?
    - a) 9th
    - b) 10th
    - c) 11th

d) 8th

14. Which National Safety Conference (NSC) was focused on small scale mining?
   a) 9th
   b) 10th
   c) 11th
   d) 8th

15. Which National Safety Conference (NSC) recommended to phase out manual loading?
   a) 9th
   b) 10th
   c) 11th
   d) 8th

Answers

1.a 2.a 3.d 4.b 5.d 6.d 7.d 8.b 9.a 10.b 11.a 12.c 13.d 14.d 15.c

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MINE MANAGEMENT

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Evolution of Management

Management is the process of reaching organizational goals by working with and through people and other organizational resources.

FMC Exam'14
What is management ?

Important functions of management are:

Planning, Organizing, Staffing, Directing and Controlling.

i. Planning

"Planning is deciding in advance - what to do, when to do & how to do. It bridges the gap from where we are & where we want to be".

It is the basic function of management. It deals with chalking out a future course of action & deciding in advance the most appropriate course of actions for achievement of pre-determined goals.

Planning is necessary to ensure proper utilization of human & non-human resources. It is all pervasive, it is an intellectual activity and it also helps in avoiding confusion, uncertainties, risks, wastages etc.

ii. Organizing

It is the process of bringing together physical, financial and human resources and developing productive relationship amongst them for achievement of organizational goals. According to Henry Fayol, "To organize a business is to provide it with everything useful or its functioning i.e. raw material, tools, capital and personnel's".

iii. Staffing

It is the function of manning the organization structure and keeping it manned. Staffing has assumed greater importance in the recent years due to advancement of technology, increase in size of business, complexity of human behaviour etc. The main purpose of staffing is to put right man on right.

iv. Directing

It refers to instructing, guiding, communicating and inspiring people in the organisation. Under directing following four activities are included:
(i) Supervision (ii) Communication (iii) Leadership (iv) Motivation

v. Controlling

It refers to bringing the actual results closer to the desired results. Under this, the manager monitors whether the jobs are being performed in accordance with the set plans or not. He also checks whether or not proper progress is being made towards the objectives and goals and act if necessary, to correct any deviation.

The main objectives of management are:

a) Getting Maximum Results with Minimum Efforts
b) Increasing the Efficiency of factors of Production
c) Maximum Prosperity for Employer & Employees
d) Human betterment & Social Justice

Management theories in order of their of evolution

1. Scientific Management Theory
2. Administrative Management Theory
3. Behavioural Management Theory
4. Management Science Theory
5. Organizational Environment Theory

1. Scientific Management Theory

Scientific management is the systematic study of relationships between people and tasks for the purpose of redesigning the work process to increase efficiency. Taylor believed that the production process would become more efficient if the amount of time and effort that each employee spent to produce a unit of output could be reduced. He noted that increased specialization and the division of labour could increase efficiency. Taylor believed that the way to create the most efficient division of labour could best be determined by means of scientific management techniques rather than intuitive or informal rule-of-thumb knowledge. On the basis of his experiments and observations as a manufacturing manager in a variety of settings, he developed four principles to increase efficiency in the workplace:

1) Replace working by "rule of thumb," and use the scientific method to study work and determine the most efficient way to perform specific tasks.
2) Rather than simply assign workers to just any job, match workers to their jobs based on capability and motivation, and train them to work at maximum efficiency.
3) Monitor worker performance, and provide instructions and supervision to ensure that they're using the most efficient ways of working.
4) Allocate the work between managers and workers so that the managers spend their time planning and training, allowing the workers to perform their tasks efficiently.

2. Administrative Management Theory

administrative management is the study of creating an organizational structure that leads to high efficiency and effectiveness.

3. THE BEHAVIOURAL THEORY

THE BEHAVIOURAL THEORY focused on how managers should personally behave in order to motivate employees and encourage them to perform at high levels and be committed to the achievement of organizational goals

i. THEORY X

According to the assumptions of Theory X, the average workeris lazy, dislikes work, and will try to do as little as possible. Moreover, workershave little ambition and wish to avoid responsibility. Thus, the manager's task isto counteract workers' natural tendencies to avoid work. To keep workers' performanceat a high level, the manager must supervise them closely and control theirbehaviour by means of "the carrot and stick"—rewards and punishment.

i. THEORY Y

In contrast, Theory Y assumes that workers are not inherentlylazy, do not naturally dislike work, and, if given the opportunity, will do what isgood for the organization. According to Theory Y, the characteristics of the worksetting determine whether workers consider work to be a source of satisfaction orpunishment; and managers do not need to control workers' behaviour closely inorder to make them perform at a high level, because workers will exercise selfcontrolwhen they are committed to organizational goals.

Management Principles developed by Henri Fayol

a) **DIVISION OF WORK:** Work should be divided among individuals and groups to ensure that effort and attention are focused on special portions of the task. Fayol presented work specialization as the best way to use the human resources of the organization.

b) **AUTHORITY:** The concepts of Authority and responsibility are closely related. Authority was defined by Fayol as the right to give orders and the power to exact obedience. Responsibility involves being accountable, and is therefore naturally associated with authority. Whoever assumes authority also assumes responsibility.

c) **DISCIPLINE:** A successful organization requires the common effort of workers. Penalties should be applied judiciously to encourage this common effort.

d) **UNITY OF COMMAND:** Workers should receive orders from only one manager.

e) **UNITY OF DIRECTION:** The entire organization should be moving towards a common objective in a common direction.

f) **SUBORDINATION OF INDIVIDUAL INTERESTS TO THE GENERAL INTERESTS:** The interests of one person should not take priority over the interests of the organization as a whole.

g) **REMUNERATION:** Many variables, such as cost of living, supply of qualified personnel, general business conditions, and success of the business, should be considered in determining a worker's rate of pay.

h) **CENTRALIZATION:** Fayol defined centralization as lowering the importance of the subordinate role. Decentralization is increasing the importance. The degree to which centralization or decentralization should be adopted depends on the specific organization in which the manager is working.

i) **SCALAR CHAIN:** Managers in hierarchies are part of a chain like authority scale. Each manager, from the first line supervisor to the president, possess certain amounts of authority. The President possesses the most authority; the first line supervisor the least. Lower level managers should always keep upper level managers informed of their work activities. The existence of a scalar chain and adherence to it are necessary if the organization is to be successful.

j) **ORDER:** For the sake of efficiency and coordination, all materials and people related to a specific kind of work should be treated as equally as possible.

k) **EQUITY:** All employees should be treated as equally as possible.

l) **STABILITY OF TENURE OF PERSONNEL:** Retaining productive employees should always be a high priority of management. Recruitment and Selection Costs, as well as increased product-reject rates are usually associated with hiring new workers.

m) **INITIATIVE:** Management should take steps to encourage worker initiative, which is defined as new or additional work activity undertaken through self direction.

n) **ESPIRIT DE CORPS:** Management should encourage harmony and general good feelings among employees.

4. Management Science Theory

Management science theory is a contemporary approach to management that focuses on the use of rigorous quantitative techniques to help managers make maximum use of organizational resources to produce goods and services.

5. Organizational environment

The set of forces andconditions that operatebeyond an organization'sboundaries but affect amanager's ability to acquireand use resources.

MULTIPLE CHOICE QUESTIONS

Evolution of Management

1. Who is a person who advanced early scientific management principles?
    a) Weber
    b) Taylor
    c) Vest
    d) Fayol
2. A reporting relationship in which an employee receives orders from, and reports to, only one supervisor is known as:
    a) Line of authority.
    b) Centralization.
    c) Unity of direction.
    d) Unity of command.
3. ______ is the singleness of purpose that makes possible the creation of one plan of action to guide managers in resource allocations.
    a) Unity of direction
    b) Unity of command
    c) Unity of authority
    d) Unity of resources
4. Theory __ is based on positive assumptions about workers.
    a) Z
    b) X
    c) Y
    d) C
5. The ______ theory states a manager's choice of organizational structures and control systems depends on characteristics of the external environment.
    a) Mechanistic
    b) Management science
    c) Organic
    d) Contingency
6. Which is not one of Fayol's principles:
    a) Authority and responsibility
    b) Line of authority
    c) Globalization
    d) Unity of command
7. Theory __ states that the average employee is lazy and will try to do as little as possible.
    a) X
    b) Y
    c) Z
    d) None
8. Fayol's theory of equity specifies that:
    a) Employees should be paid equally regardless of their positions

b) Managers should be treated equally
c) Employees should be treated with respect and justice
d) People should get equal pay for equal work

9. Fayol stated that employees tend to be more loyal and have higher morale if they feel they are being treated justly and fairly. Managers who intend to create an organizational culture that nurtures those type of employee feelings should apply Fayol's principle of __________.
   a) Centralization
   b) Equity
   c) Esprit de corps
   d) Remuneration of personnel

10. The study of management theory is important for which of the following reasons:
   a) It is scientific
   b) Management theories are interpretive and evolve with organisational changes
   c) It helps decision making
   d) All of the above

11. Which of the following best described Frederick W. Taylor?
   a) His main concern was with workplace efficiency.
   b) His main concern was with control over the workforce.
   c) His main concern was work-life balance.
   d) His main concern was working conditions.

12. Which of the following is not an aspect of Taylor's scientific management?
   a) Time and motion study
   b) Division of labour
   c) Using craft skills
   d) Separation of planning and doing

ANSWERS

1.b 2.d 3.a 4.c 5.d 6.c 7.a 8.c 9.b 10.b 11.b 12.c

Personal Management and Organisational behaviour

Definitions "Organizational behaviour is a field of study that investigates the impact that individuals, groups and organizational structure have on behaviour within the organization, for the purpose of applying such knowledge towards improving an organizational effectiveness"

Leadership Styles

Different types of leadership styles exist in work environments. Advantages and disadvantages exist within each leadership style. The culture and goals of an organization determine which leadership style fits the firm best. Some companies offer several leadership styles within the organization, dependent upon the necessary tasks to complete and departmental needs. Some of the famous leadership styles are :

1. Laissez-Faire

   Laissez-faire leadership, also known asdelegative leadership, is a type of leadership style in which leaders are hands-off and allow group members to make the decisions. This leadership can be effective when group members are highly skilled, motivated and capable of working on their own.

2. Autocratic

   The autocratic leadership style allows managers to make decisions alone without the input of others. Managers possess total authority and impose their will on employees. No one challenges the decisions of autocratic leaders.

3. Democratic

   Democratic leadership style values the input of team members and peers, but the responsibility of making the final decision rests with the participative leader. Participative leadership boosts employee morale because employees make contributions to the decision-making process.

Leadership theories

1. Great Man Theories: Great Man theories assume that great leaders are born, not made.This theory failed to explain exactly what all quality makes a great leader. He assumed that only man could have characteristic of a great leader.

2. Trait Theories: Trait theoryassumes that leader are either born or are made with certain qualities that will make them excel in leadership roles. These qualities are intelligence , sense of responsibility , creativity. This theory failed to explain about the people who have these qualities but are not leader.

3. Contingency Theories: Contingency theories of leadership focus on particularvariables related to the environment that might determine which particular style ofleadership is best suited for the situation. According to this theory, no leadership styleis best in all situations. Success depends upon a number of variables, including theleadership style, qualities of the followers, and aspects of the situation.

4. Situational Theories: Situational theories propose that leaders choose the bestcourse of action based upon situational variable. Different styles of leadership may bemore appropriate for certain types of decision-making.

5. Behavioral Theories: Behavioral theories of leadership are based upon the beliefthat great leaders are made, not born. Rooted in behaviorism, this leadership theoryfocuses on the actions of leaders, not on mental qualities or internal states. Accordingto this theory, people can learn to become leaders through teaching and observation.

Conflict

Conflict is inevitable whenever two or more people interact, whether in the workplace or at home. Conflict can occur between two or more individuals, two or more groups, or an individual and a group. When dealing with conflict in an organization, it is important to remember to address the issue, not the people.

Conflict may be defined as a disagreement between two or moreindividuals or groups, with each individual or group trying to gain acceptanceof its views or objective over others.

Conflict management

Conflict management is the process of limiting the negative aspects of conflict while increasing the positive aspects of conflict. The aim of conflict management is to enhance learning and group outcomes, including effectiveness or performance in organizational setting. Properly managed conflict can improve group outcomes .

Conflict Management Styles

Conflict management is the practice of being able to identify and handle conflicts sensibly, fairly, and efficiently. Some of the conflict management styles are explained below:

1. **Collaborating**
   I win, you win
   When to use:
   - When there is a high level of trust
   - When you don't want to have full responsibility

   - When you want others to also have "ownership" of solutions.

2. **Compromising**
   You bend, I bend
   When to use:
   - When people of equal status are equally committed to goals
   - When time can be saved by reaching intermediate settlements on individual parts of complex issues
   - When goals are moderately important

3. **Accommodating**
   I lose, you win
   When to use:
   - When an issue is not as important to you as it is to the other person
   - When you realize you are wrong and cannot win
   - When you are willing to let others learn by mistake

4. **Competing**
   I win, you lose
   When to use:
   - When you know you are right
   - When time is short and a quick decision is needed
   - When you need to stand up for your rights

5. **Avoiding**
   No winners, no losers
   When to use:
   - When the conflict is small and relationships are at stake
   - When you're counting to ten to cool off
   - When you have no power and you see no chance of getting your concerns met

Sources of Conflict

There are three levels of conflict in the life of an organization, and for every levelthere are different sources:

1. Intra –Personal Conflict: Intra personal conflict refers to the conflict within an individual. It arises from frustration, numerous goal which requires equal attention but is not possible to devote and goals having both positive and negative aspects.

2. Inter- personal Conflict: Inter personal conflict refers to the conflict between two or more individuals with a group. It arises due to differences in personalities, perceptions, temperaments, values, socio- cultural factors and role ambiguities.

3. Inter- Group Conflict: It is also called organizational conflict. It refers to the conflict between two or more sections, groups or departments in an organization. Conflict between groups is frequent and highly visible. The reasons for inter group conflict are many, such as:

a. Task Interdependence: It refers to the extent to which two departments depend on each other for information, compliance and assistance.

b. Task Ambiguity: Another important source or inter group conflict arises when i is not clear, which group is responsible for performing which task.

c. Goal incompatibility: if goals of two departments of an organization clash with each other, conflict arises.

d. Competition for limited resources: Resources' of an organization are limited, and every department tries to secure maximum share in that. It results in conflict

Types of Conflict

There are mainly two type of conflict: •

1. Functional Conflict
2. Dysfunctional Conflict

Functional Conflict: The conflict which supports the goals of a group and also improves it performance is known as a functional or a positive conflict. The functional conflict is helpful in the achievement of the goals of a group as it aids in –

- a. Analytical thinking
- b. Diffusing tension among the members of the group
- c. Promote Competition
- d. Promote group cohesiveness
- e. Identification of weakness

Dysfunctional Conflict: The conflict which obstructs the achievement of the goals of a group is called a dysfunctional or destructive conflict. The characteristics of a dysfunction conflict are:

- a. Increased tension
- b. High rate of employee turn over
- c. Increased dissatisfaction

FMC Exam'14

What is conflict management?

MULTIPLE CHOICE QUESTIONS

Personal Management & Organizational Behavior

1. The field of organizational behavior examines such questions as the nature of leadership, effective team development, ________, and ________.
   a) interpersonal conflict resolution; motivation of individuals
   b) organizational control; conflict management
   c) motivation of individuals; planning
   d) planning; development

2. ________ is/are a key trend that is having a significant impact on behavior management today.
   a) Information technology
   b) Reverse discrimination
   c) Decreasing the amount of training for managers
   d) Stay-at-home mothers

3. Factors affecting organizational behavior are ?
   a) People
   b) Environment
   c) Technology
   d) All the above

4. Organizational behavior is ?
   a) A science
   b) An art
   c) A science and art
   d) None of the above

5. The field of organizational behavior is primarily concerned with

   a) The behavior of individual and groups
   b) How resources are effectively managed
   c) Control processes and interaction between organization, external context
   d) Both a and c

6.Which of these is not a principle of great man theory?

   a) Leaders are born not made.
   b) Great men rise up in times of crisis.
   c) We can learn from the biographies of great leaders.
   d) A great leader is only great in certain situations.

7.In leadership trait theory what is a trait?
   a) A list of the things that make leaders different to everyone else.

b) A list of the key things that a leader should do to be great.
c) The list of key behaviours a leader exhibits.
d) A list of key characteristics that makes a leader great.

8. The capacity to influence people and accomplish desired objectives is called:
a) power.
b) leadership.
c) authority.
d) status.

9. The five conflict management style orientations are:
a) Competing, accommodating, avoiding, collusion, and conflict.
b) Competing, accommodating, avoiding, competition, and compromising.
c) Competing, accommodating, avoiding, cooperation, and compromising.
d) Competing, accommodating, avoiding, collaborating, and compromising.

10. Which of the conflict management styles would be most often employed where two parties from similar cultures are in conflict?
a) Compromising
b) Avoiding
c) Competing
d) Collaboration

11. A third party is brought in to resolve a dispute between two parties in an organizational conflict. The parties agree to abide by the decision of the third party. This is known as:
a) Mediation
b) Arbitration
c) Intergroup conflict resolution
d) None of the above

12. Which leadership theory suggests that effective leaders vary their style with the "readiness" of followers?
a) Situational leadership theory
b) Path-goal theory
c) Servant leadership
d) Fiedler's contingency model

Answers

1.a 2.a 3.d 4.c 5.d 6.d 7.d 8.b 9.d 10.d 11.b 12.a

Production Management

Production/operations management is the process, which combines and transforms various resources used in the production/operations subsystem of the organization into value added product/services in a controlled manner as per the policies of the organization. Therefore, it is that part of an organization, which is concerned with the transformation of a range of inputs into the required (products/services) having the requisite quality level. The set of interrelated management activities, which are involved in manufacturing certain products, is called as production management. In other words, production management involves application of planning, organizing, directing and controlling the production process.

If the same concept is extended to services management, then the corresponding set of management activities is called as operations management.

Work study is a technique which is employed to ensure the best possible use of men, machine, materials and energy in carrying out a specific activity. It deals with the techniques of

1) Method study and
2) work measurement.

1. **Method Study**

- **Motion study:** It is defined as a systematic and critical study of existing method of doing a task with a view to evolve the most efficient and economic method of doing it.

It is a method for setting up employee productivity standards in which:

i. A complex job is broken down into small or simple steps.
ii. The sequence of movements taken by the employee in performing those steps is carefully observed to detect and eliminate wasteful motion.
iii. Precise time taken for each correct movement is measured.

From these measurements, production and delivery times and prices are computed and incentive schemes are devised.

Objectives of motion study

i. To improve the procedure of doing a work.
ii. To improve the workplace layout (ultimately plant layout).
iii. To minimize the human motion for minimum fatigue of operators.

iv. To maximize the utility of resources (men, m/c, materials).
v. To improve the overall working environment.

2. Work Measurement

- **Time study**

Time study also called work measurement is the process of establishing the time that a given task would take when performed by a qualified worker at a defined level of performance.

Objectives of time study

i. To determine the standard time for various operations which helps in fixing wage rates and incentives.
ii. To estimate the cost of product accurately.
iii. To predict accurately the duration for a particular work and customer is promised accordingly.
iv. To determine the number of machines an operator can run.
v. To determine the optimum number of men and machine.
vi. To provide information for planning and scheduling.
vii. To balance the work of all workers working in a group.
viii. To compare the work efficiency of different workers/operators.

Time study should never be carried out under abnormal conditions e.g. when supply of raw material is not adequate or stopped , when machine is out of order for many days , when mine working is out stopped due to accident or roof fall etc. It is generally done when work is under smooth progress.

In this method

i. A job is divided into convenient discrete components (elements)
ii. Specified measurement technique is used to establish time required by a qualified worker to complete each element.
iii. Various elements time are added together with appropriate allowances to construct the standard time for the complete job.

Standard Time:- Standard time for any job is the time taken to complete that job by a qualified & trained worker. This time includes allowances for fatigue, changing or repairing of tools etc.

Observed Time:- Observed time is the time taken by an operator while actually working to complete task. It is the time slot consumed from start to finish of the operation of any allowances.

$$\text{Average Observed Time} = \frac{\text{Sum of the times recorded to perform each element}}{\text{No of observations}}$$

$$\text{Normal Time} = \text{Average Observed Time} \times \text{Performance Rating Factor}$$

Add the Normal times of each element to develop the Total Normal Time for the task.

$$\text{Standard Time} = \frac{\text{Total Normal Time}}{\text{1-Allowance Factor}}$$

Complex projects require a series of activities, some of which must be performed sequentially and others that can be performed in parallel with other activities. This collection of series and parallel tasks can be modeled as a network.

A PERT chart is a project management tool used to schedule, organize, and coordinate tasks within a project.

PERT requires triple time estimate.

Optimistic Time(O) :- Optimistic Time is the minimum possible time required to accomplish a task assuming everything proceed better than the normal.

Pessimistic Time(P) :- Pessimistic Time is the maximum possible time required to accomplish a task assuming everything goes wrong.

Most Likely Time (M) :- Most likely time is the best estimate of the time required to accomplish a task , assuming everything proceeds as normal.

Relationship between Optimistic Time(O), Pessimistic Time(P), Most Likely Time (M)

$$\text{Expected Time} = \frac{(O+4M+P)}{6}$$

The critical path method (CPM) is a step-by-step methodology, technique or algorithm for planning projects with numerous activities that involve complex, interdependent interactions. CPM is an important tool for project management because it identifies critical and non-critical tasks to prevent conflicts and bottlenecks.

Difference between PERT and CPM

PERT	CPM
PERT is a probabilistic model with uncertainty in activity duration.	CPM is a deterministic model with well known activity duration.
It is an event oriented approach.	It is an activity oriented approach.
PERT basically does not demarcate between critical and non-critical activities.	CPM marks the critical activities

The ratio of aggregate output to the aggregate input is called productivity.

$$\text{Productivity} = \frac{\text{output}}{\text{Input}}$$

For survival of any organization, this productivity ratio must be at least 1.If it is more than 1, the organization is in a comfortable position.

$$\text{OMS(Output per man shift)} = \frac{\text{Total Production in Tonne}}{\text{Total man-shift}}$$

$$\text{OMY(Output per man year)} = \frac{\text{Total Production in Tonne}}{\text{Total man-year}}$$

$$\text{OMS for opencast mine} = \frac{\text{Coal Production(te)} + d \times \text{OB}(m^3)}{\text{Total Man Shift}(1+s)}$$

Where,

d = density of coal
s = stripping ratio(m^3/te)

Ergonomics in Mining

Many mining jobs being partially or fully mechanized, much more time is spent operating machinery and driving vehicles . These machines are referred to as Heavy Earth Moving Machineries (HEMMs) and include Dumpers, Dozers, Loaders, Excavatorsetc. Shift towards mechanisation has definitely boosted the production many folds, but has also brought new occupational hazard and different safety concerns. Neglecting ergonomic consideration in the workplace contributes heavily to the incidence of musculoskeletal disorders.

ILO has recognized Musculoskeletal disorders (MSDs) as occupational disease (ILO, 2010). MSDs are disorders of the muscles, tendons, peripheral nerves, or vascular system not directly resulting from an acute or instantaneous event (e.g. slips or falls). These disorders are considered to be work-related when the work environment and the performance at work contribute significantly to the causation.

The term "**ergonomics**" can simply be defined as the study of work. It is the science of fitting jobs to the people who work in them. Adapting the job to fit the worker can help reduce ergonomic stress and eliminate many potential ergonomic disorders (e.g., carpel tunnel syndrome, trigger finger, tendonitis). Ergonomics focuses on the work environment and items such as the design and function of workstations, controls, displays, safety devices, tools and lighting to fit the employee's physical requirements, capabilities and limitations to ensure his/her health and well being.

MULTIPLE CHOICE QUESTIONS

Production Management

1. In time study, the rating factor is applied to determine
   a) normal time of a worker
   b) fixation of incentive rate
   c) merit rating of the worker
   d) standard time of a job
2. Ergonomics is the study of
   a) work.
   b) ergos.
   c) the management of technology.
   d) the use of automation in a manufacturing organization.
3. A flow diagram is
   a) used to analyze the movement of people or materials.
   b) a way of improving utilization of an operator and a machine.
   c) a chart depicting right- and left-hand motions.
   d) used to examine the ergonomics of a job.
4. Normal time is
   a) the arithmetic mean of the times for each element measured, adjusted for unusual influence for each element.
   b) the time that workers never exceed when performing the task.
   c) the time after adjusting for allowances for personal needs, unavoidable delays, and fatigue.
   d) the observed time adjusted for pace.
5. If normal time is 2.00 minutes and the allowance factor is 20%, what is the standard time for this task?
   a) 2.00 minutes
   b) 0.40 minutes
   c) 2.50 minutes
   d) cannot be determined from the information given
6. Methods analysis focuses on
   a) the design of the machines used to perform a task.
   b) the raw materials that are consumed in performing a task.
   c) how a task is accomplished.
   d) reducing the number of steps required to perform a task.
7. Methods analysis focuses on
   a) quality of output.
   b) how a task is accomplished.

c) quantity of output.
d) noise, illumination, and temperature of the workplace.

8. Which of the following is NOT a method of determining time standards?
   a) flow diagrams
   b) time study
   c) historical experience
   d) predetermined time standards
9. If the average observed time for an element is 2.00 minutes and the performance rating is 80%, what is the normal time for this element?
   a) 2.50 minutes
   b) cannot be determined from the information given
   c) 1.60 minutes
   d) 2.00 minutes
10. Which of these is not correct
   a) PERT is probabilistic in nature.
   b) CPM is deterministic in nature.
   c) CPM is event-oriented.
   d) CPM and PERT use similar terminology but were developed independently

Answers

1.b 2.a 3.a 4.d 5.c 6.c 7.b 8.a 9.c 10.c

Financial Management

Financial Management is the planning, directing, monitoring, organizing, and controlling of the monetary resources of an organization.

Objectives of Financial Management

The financial management is generally concerned with procurement, allocation and control of financial resources of a concern. The objectives can be-

1. To ensure regular and adequate supply of funds to the concern.
2. To ensure adequate returns to the shareholders which will depend upon the earning capacity, market price of the share, expectations of the shareholders.
3. To ensure optimum funds utilization. Once the funds are procured, they should be utilized in maximum possible way at least cost.
4. To ensure safety on investment, i.e, funds should be invested in safe ventures so that adequate rate of return can be achieved.
5. To plan a sound capital structure-There should be sound and fair composition of capital so that a balance is maintained between debt and equity capital.

Capital Budgeting

Capital Budgeting is the process of analysing & ranking proposed projects to determine which ones are deserving of an investment.Capital budgeting uses the concept of present value to select the projects.

Capital Budgeting projects are classified as either Independent projects or Mutually Exclusive Projects.

An Independent Project is a project whose cash flows are not affected by the accept/reject decision for other projects. Thus, all **Independent Projects which** meet the Capital Budgeting critieria should be accepted.

Mutually Exclusive Projects – projects are mutually exclusive when accepting one investment means rejecting others.

A Capital Budgeting decision rule should satisfy the following criteria:

- Must consider all of the project's cash flows.
- Must consider the Time Value of Money
- Must always lead to the correct decision when choosing among Mutually Exclusive Projects.

Capital budgeting uses following to select projects :

1. Payback Period
2. Accounting Rate of Return
3. Net Present Value
4. Internal Rate of Return
5. Profitability Index Payback

Payback period

Payback period is the time in which the initial cash outflow of an investment is expected to be recovered from the cash inflows generated by the investment.

Formula

The formula to calculate payback period of a project depends on whether the cash flow per period from the project is even or uneven. In case they are even, the formula to calculate payback period is:

$$\text{Payback Period} = \frac{\text{Initial Investment}}{\text{Cash Inflow per Period}}$$

When cash inflows are uneven, we need to calculate the cumulative net cash flow for each period and then use the following formula for payback period:

$$\text{Payback Period} = A + \frac{B}{C}$$

In the above formula,
A is the last period with a negative cumulative cash flow;
B is the absolute value of cumulative cash flow at the end of the period A;
C is the total cash flow during the period after A

According to this method, the project that promises a quick recovery of initial investment is considered desirable.

For payback periods, the decision rules are as follows:
If payback period < the minimum payback, accept the project
If payback period > the minimum payback, reject the project.

Example 1: Even Cash Flows

Company x is planning to undertake a project requiring initial investment of Rs 105 million. The project is expected to generate Rs 25 million per year for 7 years. Calculate the payback period of the project.

Solution

Payback Period = Initial Investment ÷ Annual Cash Flow = Rs 105M ÷ Rs 25M = 4.2 years

Example 2: Uneven Cash Flows

Company X is planning to undertake another project requiring initial investment of Rs 50 million and is expected to generate Rs10 million in Year 1, Rs 13 million in Year 2, Rs 16 million in year 3, Rs 19 million in Year 4 and Rs 22 million in Year 5. Calculate the payback value of the project.

(cash flows in millions)

Year	Cash Flow	Cumulative Cash Flow
0	(50)	(50)
1	10	(40)
2	13	(27)
3	16	(11)
4	19	8
5	22	30

Solution

Payback Period
= 3 + (Rs 11M ÷ Rs 19M)
≈ 3 + 0.58
≈ 3.58 years

Advantages and Disadvantages

Advantages of payback period are:

1. An investment project with a short payback period promises the quick inflow of cash. It is therefore, a useful capital budgeting method for cash poor firms.
2. A project with short payback period can improve the liquidity position of the business quickly. The payback period is important for the firms for which liquidity is very important.
3. An investment with short payback period makes the funds available soon to invest in another project.
4. A short payback period reduces the risk of loss caused by changing economic conditions and other unavoidable reasons.

5. Payback period is very easy to compute.

Disadvantages of payback period are:

1. Payback period does not take into account the time value of money which is a serious drawback since it can lead to wrong decisions. A variation of payback method that attempts to remove this drawback is called discounted payback period method.
2. It does not take into account, the cash flows that occur after the payback period.
3. It is essentially a time concept. It does not consider the rate of return.

FMC Exam'14
What is Pay back period?

Net Present Value (Npv)

Net present value of an investment/project is the difference between present value of cash inflows and cash outflows. The present values of cash flows are obtained at a discount rate equivalent to the cost of capital.

Formula:

$$NPV = \left[\frac{C_1}{(1+i)^1} + \frac{C_2}{(1+i)^2} + \frac{C_3}{(1+i)^3} + \dots \right] - \text{Initial Investment}$$

Where,
i is the target rate of return per period;
CF_1 is the period one net cash inflow;
CF_2 is the period two net cash inflow,
CF_3 is the period three net cash inflow, and so on ...

Decision Rule

In case of standalone projects, accept a project only if its NPV is positive, reject it if its NPV is negative and stay indifferent between accepting or rejecting if NPV is zero.

In case of mutually exclusive projects (i.e. competing projects), accept the project with higher NPV.

Advantages and disadvantages of NPV

Advantages

1. Net present value accounts for time value of money which makes it a sounder approach than other investment appraisal techniques which do not discount future cash flows such payback period and accounting rate of return.
2. Net present value is even better than some other discounted cash flows techniques such as IRR. In situations where IRR and NPV give conflicting decisions, NPV decision should be preferred.

Disadvantages

1. NPV is after all an estimation. It is sensitive to changes in estimates for future cash flows, salvage value and the cost of capital.
2. Net present value does not take into account the size of the project.

For example, say Project A requires initial investment of 4 million to generate NPV of Rs.1 million while a competing Project B requires Rs.2 million investment to generate an NPV of Rs.0.8 million. If we base our decision on NPV alone, we will prefer Project A because it has higher NPV, but Project B has generated more shareholders' wealth per dollar of initial investment (Rs.0.8 million/Rs.2 million vs Rs.1 million/Rs.4 million).

Internal Rate of Return (IRR)

Internal rate of return (IRR) is the discount rate at which the net present value of an investment becomes zero. In other words, IRR is the discount rate which equates the present value of the future cash flows of an investment with the initial investment.

Decision Rule

A project should only be accepted if its IRR is NOT less than the target internal rate of return. When comparing two or more mutually exclusive projects, the project having highest value of IRR should be accepted.

IRR Calculation

The calculation of IRR is a bit complex than other capital budgeting techniques. We know that at IRR, Net Present Value (NPV) is zero, thus:NPV = 0; or

PV of future cash flows − Initial Investment = 0; or

$$\left[\frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots \right] - \text{Initial Investment} = 0$$

Where,
r is the internal rate of return;
CF_1 is the period one net cash inflow;
CF_2 is the period two net cash inflow,
CF_3 is the period three net cash inflow, and so on ...

Comparison of NPV and IRR

Net present value is an absolute measure NPV is dependent on the size of the project	IRR on the other hand is a relative measure IRR is not affected by the size of the project.

Conclusion

Whenever there is a conflict in ranking of projects based on NPV and IRR, it is safer to always prefer the NPV ranking. This is due to the realistic assumption and theoretical soundness of the method.

Break Even Point

The break even point is the production level where total revenues equals total expenses. In other words BEP is the point at which there is no net loss or gain.

The equation method is based on the cost-volume-profit (CVP) formula:

$px = vx + FC + \text{Profit}$

Where,
p is the price per unit,
x is the number of units,
v is variable cost per unit and
FC is total fixed cost.

Calculation

BEP in Sales Units

At break-even point the profit is zero therefore the CVP formula is simplified to:
$px = vx + FC$

Solving the above equation for x which equals break-even point in sales units, we get:

$$\text{Break-even Sales Units} = x = \frac{FC}{p - v}$$

Example

Calculate break-even point in sales units and sales dollars from following information:

Price per Unit	Rs.15
Variable Cost per Unit	Rs.7
Total Fixed Cost	Rs.9,000

Solution

We have,
$p = \text{Rs.}15$
$v = \text{Rs.}7$, and
$FC = \text{Rs.}9{,}000$

Substituting the known values into the formula for breakeven point in sales units, we get:

Breakeven Point in Sales Units (x)
$= 9{,}000 \div (15 - 7)$
$= 9{,}000 \div 8$
$= 1{,}125$ units

Break-even Point in Sales Rupees = Rs.15 × 1,125 = Rs.16,875

Contribution Margin

Contribution margin (CM) is the amount by which sales revenue exceeds variable costs. The contribution margin measures how efficiently a company can produce products and maintain low levels of variable costs It can be calculated as contribution margin per unit as well as total contribution margin, using the following formulas:

Unit CM = Unit Price – Variable Cost per Unit

Total CM = Total Sales – Total Variable Costs

Total contribution margin can also be obtained by multiplying unit contribution margin by number of units sold. Similarly, contribution margin per unit can also be calculated by divided total contribution margin by number of units sold.

Variable costs are those which vary in proportion to the level of production. Variable cost may be direct as well as indirect. Direct variable cost includes direct material cost and direct labor cost. Indirect variable costs include certain variable overheads.

Fixed Costare those which do not vary in proportion to the level of production.e.g. office rent , salary of employees.

Total contribution margin can also be obtained by multiplying unit contribution margin by number of units sold. Similarly, contribution margin per unit can also be calculated by divided total contribution margin by number of units sold.

Contribution Margin Ratio

Contribution margin ratio is contribution margin as percentage of sales. It can be calculated as shown in the following formula:

$$\text{CM Ratio} = \frac{\text{Unit Contribution Margin}}{\text{Unit Price}} = \frac{\text{Total Contribution Margin}}{\text{Total Sales}}$$

Contribution margin and contribution margin ratio are used in the breakeven analysis.

Example

Use the following information to calculate unit contribution margin, total contribution margin and contribution margin ratio:

Price Per Unit=Rs.22
Units Sold =802
Total Variable Cost Rs.=9,624
Solution:
Total Sales = 802 × Rs.22 = Rs.17,644
Total Contribution Margin= Rs.17,644 – Rs.9,624 = Rs.8,020
Contribution Margin Per Unit = Rs.8,020 ÷ 802 = Rs.10
CM Ratio = Rs.8,020 ÷ Rs.17,644 = Rs.10 ÷ Rs.22 ≈ 45%

Working capital management

Working capital management involves the relationship between a firm's short-term assets and its short-term liabilities. The goal of working capital management is to ensure that a firm is able to continue its operations and that it has

sufficient ability to satisfy both maturing short-term debt and upcoming operational expenses. The management of working capital involves managing inventories, accounts receivable and payable, and cash.

Working Capital = Current Assets – Current Liabilities

Examples

Company A has current assets of Rs 5 million and current liabilities of Rs 3 million. Its working capital will be Rs 2 million (Rs 5 million minus Rs 3 million).

Current assets refer to those assets which in the ordinary course of business can be, or will be, converted into cash within one year without undergoing a diminution in value and without disrupting the operations of the firm. Examples- cash, marketable securities, accounts receivable and inventory.

Current liabilities are those liabilities which are intended, at their inception, to be paid in the ordinary course of business, within a year, out of the current assets or the earnings of the concern. Examples- accounts payable, bills payable, bank overdraft and outstanding expenses.

Analysis

If current assets of a business at the point in time are more than its current liabilities the working capital is positive, and this tells that the company is not expected to suffer from liquidity crunch in near future. However, if current assets are less than current liabilities the working capital is negative, and this communicates that the business may not be able to pay off its current liabilities when due.

Objective of Working Capital Management.

The goal of working capital management is to manage the firm's current assets and liabilities in such a way that a satisfactory level of working capital is maintained.The interaction between current assets and current liabilities is, therefore the main theme of the theory of the working capital management.

Liquidity ratios

Liquidity ratios are the ratios that measure the ability of a company to meet its short term debt obligations. These ratios measure the ability of a company to pay off its short-term liabilities when they fall due.The liquidity ratios are a result of dividing cash and other liquid assets by the short term borrowings and current liabilities. They show the number of times the short term debt obligations are covered by the cash and liquid assets. If the value is greater than 1, it means the short term obligations are fully covered.Generally, the higher the liquidity ratios are, the higher the margin of safety that the company posses to meet its current liabilities. Liquidity ratios greater than 1 indicate that the company is in good financial health and it is less likely fall into financial difficulties.

Most common examples of liquidity ratios include current ratio, acid test ratio (also known as quick ratio), cash ratio and working capital ratio.

Current ratio

It measures the ability of a business to repay current liabilities with current assets.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Cash ratio

It measures the ability of a business to repay its current liabilities by only using its cash and cash equivalents and nothing else.

Cash Ratio = Cash + Cash EquivalentsCurrent Liabilities

Quick ratio or Acid Test ratio

It measures the ability of a company to pay its debts by using its cash and near cash current assets

Quick Ratio

$$= \frac{\text{Current Assets} - \text{Inventory} - \text{Prepayments}}{\text{Current Liabilities}}$$

Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) is software that attempts to integrate all departments and functions across a company onto a single computer system that can serve all those departments' particular needs. ERP allows a company to automate and integrate the majority of its business processes, includingproduct planning, purchasing, production control, inventory control, interaction with suppliers and customer, delivery of customer service and keeping track of orders,to share common data and practices across the entire enterprise, and to produce and access information in a real-time environment. ERP enables decision-makers to have an enterprise-wide view of the information they need in a timely, reliable and consistent fashion.

Reasons for adopting ERP

a) Integrate financial information
b) Integrate customer order information
c) Standardize and speed up operations processes
d) Reduce inventory
e) Standardize Human Resources information

Advantages of ERP

Advantages of having ERP in a company are as follows:

a) Increase inventory turns
b) Increase inventory accuracy rate
c) Reduce inventory costs
d) Improve customer service
e) Reduce setup times
f) Reduce paper work.
g) Provide a unified customer database usable by all applications
h) Provide greater and effective control on account.
i) Faster response and follow ups to customers
j) Improves supply demand linkage with remote locations and branches in different locations
k) Higher quality, less re-work

Challenges of ERP Implementation

a) Customization Related Challenges
b) Redesigning Business Processes
c) Cost of upgrades/updates
d) Training
e) Little flexibility in adapting to business processes
f) High integration costs
g) High maintenance costs
h) Lengthy or incomplete integrations

MULTIPLE CHOICE QUESTIONS

Financial Management

1. **Which of the following statement is not true for break even analysis?**
   - a) Fixed cost does not vary with total production
   - b) Total cost varies with the total production
   - c) Variable cost is dependent on total production
   - d) Break even point is the point where fixed cost line and variable cost line intersect with each other on a volume cost graph.
2. Which of the following will not be a relevant factor when using the payback method of capital investment appraisal?
   - a) The total cash flows generated by the asset
   - b) The cash flows generated by the asset up to the payback period
   - c) The timing of the first cash inflow
   - d) The cost of the asset
3. A project would normally be undertaken if its net present value is:
   - a) Exactly the same as the NPV of existing projects
   - b) Positive
   - c) Zero
   - d) Negative
4. Why is the payback method often considered inferior to discounted cash flow in capital investment appraisal?
   - a) It only takes into account the future income of a project
   - b) It does not take account of the time value of money
   - c) It is more difficult to calculate
   - d) It does not calculate how long it will take to recoup the money invested
5. Which of the following statements is true?
   - a) Investments that yield a positive internal rate of return should be accepted
   - b) Investments that have a positive net present value should always be accepted
   - c) Investments that have a positive net present value should be considered for acceptance
   - d) Investments that pay back in five years or less should always be accepted

6. Which of the following statements concerning the payback period, is not true?
   - a) The payback period is simple to calculate and understand.
   - b) The payback period measures the time that a project will take to generate enough cash flows to cover the initial investment.
   - c) The payback period ignores cash flows after the payback point has been reached.
   - d) It takes account of the time value of money.
7. Which of the following statements concerning the NPV is not true?
   - a) The NPV technique takes account of the time value of money.
   - b) The NPV of a project is the sum of all the discounted cash flows associated with a project.
   - c) The NPV technique takes account of all the cash flows associated with a project.
   - d) If two competing projects are being considered, the one expected to yield the lowest NPV should be selected.
8. Which of the following pieces of information will not be needed to ascertain the break-even volume level?
   - a) Fixed overheads
   - b) Total direct costs
   - c) Variable cost per unit
   - d) Selling price
9. Contribution can be best expressed as:
   - a) The difference between selling price and total cost per unit
   - b) The difference between selling price and absorption cost per unit
   - c) The difference between selling price and variable cost per unit
   - d) The difference between selling price and fixed cost per unit

10. Which of the following is not a method of capital investment appraisal?
    - a) Internal rate of return
    - b) Payback
    - c)Net book value
    - d) Net present value
11. The discount rate that results in an NPV of zero is known as:
    - a) Payback period
    - b) Internal rate of return
    - c) Discount factor
    - d) Break-even point

12. In break even analysis, the break even point symbolizes:
    - a) No profit and no loss situation

b) No profit but loss situation

c) No loss but profit situation

d) None of the above

Answers

1.d 2.a 3.b 4.b 5.c 6.d 7.b 8.b 9.c 10.c 11.b 12.a

Mining Environment

Environment Impact Assessment(EIA)

Environment Impact Assessment(EIA) is a procedure used to examine the environmental consequences or impacts, both beneficial and adverse, of a proposed development project and to ensure that these effects are taken into account in project design. The EIA is therefore based on predictions. These impacts can include all relevant aspects of the natural, social, economic and human environment.

The main purpose of EIA is to inform decision makers of the likely impacts of a proposal before a decision is made. EIA provides an opportunity to identify key issues and stakeholders early in the life of a proposal so that potentially adverse impacts can be addressed before final approval decisions are made.

The EIA process in India is made up of the following phases:

i. Screening
ii. Scoping and consideration of alternatives
iii. Baseline data collection
iv. Impact prediction
v. Assessment of alternatives, delineation of mitigation measures and environmental impact statement
vi. Public hearing
vii. Environment Management Plan
viii. Decision making
ix. Monitoring the clearance conditions

Screening

Screening is done to determine whether or not a proposal should be subject to EIA and, if so, at what level of detail.

Scoping

The aim of EIA is not to carry out exhaustive studies on all environmental impacts for all projects. Scoping is used to identify the key issues of concern at an early stage in the planning process.The results of scoping will determine the scope, depth and terms of reference to be addressed within the Environmental statement.

Baseline Data Collection

The term "baseline" refers to the collection of background information on the biophysical, social and economic settings proposed project area. Normally, information is obtained from secondary sources, or the acquisition of new information through field samplings, interviews, surveys and consultations with the public. The task of collecting baseline data starts right from the period of project inception; however, a majority of this task may be undertaken during scoping and actual EIA. Baseline data is collected for two main purposes

i. To provide a description of the current status and trends of environmental factors (e.g., air pollutant concentrations) of the host area against which predicted changes can be compared and evaluated in terms of significance,
ii. To provide a means of detecting actual change by monitoring once a project has been initiated.

Impact analysis and prediction

Predicting the magnitude of a development likely impacts and evaluating their significance is core of environmental assessment process. Prediction should be based on the available environmental baseline of the project area.

Assessment of alternatives, delineation of mitigation measures and environmental impact statement

For every project, possible alternatives should be identified and environmental attributes compared. Alternatives should cover both project location and process technologies. Alternatives should consider no project option also. Alternatives should then be ranked for selection of the best environmental option for optimum economic benefits to the community at large.Once alternatives have been reviewed, a mitigation plan should be drawn up for the selected option and is supplemented with an Environmental Management Plan (EMP) to guide the proponent towards environmental improvements. The EMP is a crucial input to monitoring the clearance conditions and therefore details of monitoring should be included in the EMP.

An EIA report should provide clear information to the decision-maker on the different environmental scenarios without the project, with the project and with project alternatives. Uncertainties should be clearly reflected in the EIA report.

The objectives of mitigation therefore are to:

i. Find better alternatives and ways of doing things;
ii. Enhance the environmental and social benefits of a project
iii. Avoid, minimise or remedy adverse impacts; andensure that residual adverse impacts are kept within acceptable levels

Approach	Examples
Avoid	Change of route or site details, to avoid important ecological or archaeological features
Replace	Regenerate similar habitat of equivalent ecological value in different location.
Reduce	Filters, precipitators, noise barriers, dust, enclosures, visual screening, wildlife corridors, and changed time of activities
Restore	Site restoration after construction
Compensate	Relocation of displaced communities, facilities for the affected communities, financial compensation for the affected individuals etc

Public Hearing

Law requires that the public must be informed and consulted on a proposed development after the completion of EIA report.

Decision Making

Decision making process involve consultation between the project proponent (assisted by a consultant) and the impact assessment authority (assisted by an expert group if necessary)

The decision on environmental clearance is arrived at through a number of steps including evaluation of EIA and EMP.

Monitoring the Clearance Conditions

Monitoring should be done during both construction and operation phases of a project.This is not only to ensure that the commitments made are complied with but also to observe whether the predictions made in the EIA reports were correct or not. Where the impacts exceed the predicted levels, corrective action should be taken. Monitoring will enable the regulatory agency to review the validity of predictions and the conditions of implementation of the Environmental Management Plan (EMP).

Environmental Management Plan (EMP)

An Environmental Management Plan (EMP) is a detailed plan and schedule of measures necessary to minimize, mitigate, etc. any potential environmental impacts identified by the EIA. Once the EIA the significant impacts have been identified, it is necessary to prepare an Environmental Management Plan. An EMP should consist of a set of mitigation, monitoring and institutional measures to be taken during the implementation and operation of the proposed project to eliminate adverse environmental impacts, offset them or reduce them to acceptable levels. The EMP should also include the actions needed to implement these measures, including the following features:

i. Mitigation based on the environmental impacts reported in the EIA, the EMP should describe with technical details each mitigation measure.
ii. The EMP should then include monitoring objectives that specifies the type of monitoring activities that will be linked to the mitigation measures.

EMP must be operative throughout the whole Project Cycle

Major important types of wastewater treatment process are as follows:

1. Effluent Treatment Plants (ETP)
2. Sewage Treatment Plants (STP)

Effluent Treatment Plants (ETP)- is to use to purify waste water which comes from different type of manufacturing, mining , textile, chemical industry.
Basic process involved in effluent treatment plant are:

a. Effluent from different manufacturing industry
b. Primary Filtration
c. Cooling and Mixing
d. Neutralization (by acid or alkali)
e. Chemical Co-agulation
f. Settling and Separation of Sludge
g. Pressure Filtration
h. Discharge

Primary Filtration: It is the first stage of effluent treatment plant, where effluent comes from different sources. Primary filtration is performed to remove solid waste particles.

Cooling and Mixing: In this stage, different types of effluent are mixed and cool down by the help of motor which run a fan.

Neutralization Tank: After cooling and mixing; effluent is transferred to neutralization tank by the help of pump. Here, acid or alkali is mixed to neutralize the effluent. A pH meter is placed in the neutralization tank.

Co-agulant Bath: After neutralization of effluent; effluent is transferred to a co-agulant bath. Here, co-agulant is added with the effluent.

Settling Tank: Here effluent separates from the water and it found in the lower level of the tank. Effluent is like as sludge.

Pressure Filter: Here, filtration is done under pressure. A certain amount of pressure is created here.

Carbon Filtration: It is an optional filter process.

Discharge to Drain: After completion of all the process, the effluent becomes purify and it becomes safe to drain to the environment.

Sewage Treatment Plants (STP)

Sewage treatment, or domestic wastewater treatment, is the process of removing contaminants from wastewater and household sewage, both runoff (effluents) and domestic. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream (or treated effluent) and a solid waste or sludge suitable for discharge or reuse back into the environment. This material is often inadvertently contaminated with many toxic organic and inorganic compounds.

Pre-treatment removes materials that can be easily collected from the raw wastewater before they damage or clog the pumps and skimmers of primary treatment clarifiers, for example, trash, tree limbs, leaves, etc.,

Primary Treatment:

In the primary sedimentation stage, sewage flows through large tanks, commonly called "primary clarifiers" or "primary sedimentation tanks". The tanks are large enough that sludge can settle and floating material such as grease and oils can rise to the surface and be skimmed off. The main purpose of the primary sedimentation stage is to produce both a generally homogeneous liquid capable of being treated biologically and a sludge that can be separately treated or processed.

Primary settling tanks are usually equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank from where it can be pumped to further sludge treatment stages. Grease and oil from the floating material can sometimes be recovered for specifications.

Secondary Treatment:

Secondary treatment is designed to substantially degrade the biological content of the sewage which is derived from human waste, food waste, soaps and detergent. The majority of municipal plants treat the settled sewage liquor using aerobic biological processes. For this to be effective, the biota requires both oxygen and a substrate on which to live.

There are a number of ways in which this is done. In all these methods, the bacteria and protozoa consume biodegradable soluble organic contaminants (e.g. sugars, fats, organic short-chain carbon m molecules, etc.) and bind much of the less soluble fractions into floe.

Final Treatment

Now the 'almost' treated wastewater is passed through a settlement tank. Here, more sludge is formed at the bottom of the tank from the settling of the bacterial action. Again, the sludge is scrapped and collected for treatment. The water at this stage is almost free from harmless substances and chemicals. The water is allowed to flow over a wall where it is filtered through a bed of sand to remove any additional particles.

The filtered water is then released into the river

Mine Closure Plan

1.Mine closure—as a process—refers to the period of time when the operational stage of a mine is ending or has ended and the final decommissioning and mine rehabilitation is being undertaken. Closure may be only temporary in some cases or may lead into a programme of care and maintenance.

As per Mineral Concession Rules, 1960 and Mineral Conservation and Development Rules, 1988 all the mining lessee are required to submit "Final Mines Closure Plan" one year prior to the proposed closure of the mine .The "Progressive Closure Plan" and "Final Closure Plan" should be in the formatand as per the guidelines issued by the Indian Bureau of Mines.

2. Mine closure encompasses rehabilitation process as an ongoing programme designed to restore physical, chemical and biological quality disturbed by the mining to a level acceptable to all concerned. It must aim at leaving the area in such a way that rehabilitation does not become a burden to the society after mining operation is over. It must also aim to create as self-sustained ecosystem.

3. Mine closure operation is a continuous series of activities starting from day one of the initiation of mining project. Therefore, progressive mine closure plan should be reviewed every five years in the Scheme of Mining.

4. Final mine closure plan shall be considered to have its approval at least nine months before the date of proposed closure of mine. This period of nine months is reckoned as preparatory period for final mine closure operations. Therefore, all proposals for activities which have to be carried out after production of mineral from the mine or mining is ceased, shall be included in the final mine closure plan. The final mine closure plan will thus be a separate document with detailed chapters as per guidelines given below.

The mine closure plan will be prepared as per the guidelines given. The guidelines include the specific activities both in progressive mine closure plan and final mine closure plan.

GUIDELINES FOR MINE CLOSURE PLAN

1. Introduction:

The name of the lessee, the location and extent of lease area, the type of lease area (forest, non-forest etc), the present land use pattern, the method of mining and mineral processing operations, should be given.

1.1 *Reasons for closure* : The reasons for closure of mining operations in relation to exhaustion of mineral, lack of demand, uneconomic operations, natural calamity, directives from statutory organisation or court etc. should be specified.

1.2 *Statutory obligations* : The legal obligations, if any which the lessee is bound to implement like special conditions imposed while execution of lease deed, approval of mining plan, directives issued by the Indian Bureau of Mines, conditions imposed by the Ministry of Environment and Forests, State of Central Pollution Control Board or by any other organisation describing the nature of conditions and compliance position thereof should be indicated here

1.3 *Closure plan preparation* : The names and addresses of the applicant and recognised qualified person who prepared the Mine Closure Plan and the name of the existing agency should be furnished.

2. Mine Description:

2.1 *Geology:* Briefly describe the topography and general geology indicating rock types available, the chemical constituents of the rocks / minerals including toxic elements if any, at the mine site.

2.2 *Reserves* : Indicate the mineral reserves available category wise in the lease area estimated in the last mining plan / mining scheme approved along with the balance mineral reserves at the proposed mine closure including its quality available (for final mine closure plan only).

2.3 *Mining Method* : Describe in brief the mining method followed to win the mineral, extent of mechanisation , mining machinery deployed, production level etc.

2.4 *Mineral Beneficiation* : Describe in brief the mineral beneficiation practice if any indicating the process description in short. Indicate discharge details of any tailings / middlings and their disposal / utilisation practice followed.

3. Review of Implementation of Mining Plan / Scheme of Mining including five years Progressive Closure Plan upto final closure of mine:
Indicate in detail the various proposals committed with special emphasis on the proposals for protection of environment in the approved Mining Plan / Scheme of Mining including five years Progressive Closure Plan upto the closure of mine vis-a-vis their status of implementation. Highlight the areas, which might have been contaminated by mining activities and type of contaminants that might be found there. The reasons for deviation from the proposals if any with corrective measures taken should also be given.

4.Closure Plan :
4.1 *Mined-Out Land* : Describe the proposals to be implemented for reclamation and rehabilitation of mined-out land including the manner in which the actual site of the pit will be restored for future use. The proposals should be supported with relevant plans and sections depicting the method of land restoration / reclamation / rehabilitation.
4.2 *Water Quality Management* : Describe in detail the existing surface and ground water bodies available in the lease areas and the measures to be taken for protection of the same including control of erosion, sedimentation, siltation, water treatment, diversion of water courses , if any, measures for protection of contamination of ground water from leaching etc. Quantity and quality of surface water bodies should also be indicated and corrective measures proposed to meet the water quality conforming the permissible limits should also be described. Report of hydrological study carried out in the area may also be submitted. The water balance chart should be given. If there is potential of Acid Mine Drainage the treatment method should be given.

4.3 *Air Quality Management* : Describe the existing air quality status. The corrective measures to be taken for prevention of pollution of air should be described.

4.4. *Waste Management* : Describe the type, quality and quantity of overburden, mineral reject etc. available and their disposal practice. If no utilisation of waste material is proposed, the manner in which the waste material will be stabilised should be described. The protective measures to be taken for prevention of siltation, erosion and dust generation from these waste material should also be described. If toxic and hazardous elements are present in the waste material the protective measures to be taken for prevention of their dispersal in the air environment, leaching in the surface and ground water etc, should be described.

4.5 *Top-Soil Management* : The top soil available at the site and its utilisation should be described.

4.6 *Tailing Dam Management* : The steps to be taken for protection and stability of tailing dam, stabilisation of tailing material and its utilisation, periodic desilting, measures to prevent water pollution from tailings etc., arrangement for surplus water overflow alongwith detail design, structural stability studies, the embankment seepage

loss into the receiving environment and ground water contaminant if any should be given.

4.7 *Infrastructure* : The existing infrastructural facilities available such as roads, aerial ropeways, conveyer belts, railways, power lines, buildings & structures, water treatment plant, transport, water supply sources in the area etc. and their future utilisation should be evaluated on case to case basis. If retained, the measures to be taken for their physical stability and maintenance should be described. If decommissioning proposed, dismantling and disposal of building structures, support facilities and other infrastructure like electric transmission line, water line, gas pipeline, water works, sewer line, telephone cables, underground tanks, transportation infrastructure like roads, rails, bridges, culverts etc., electrical equipments and infrastructures like electric cables, transformers to be described in connection with restoring land for further use.

4.8 *Disposal of Mining Machinery* : The decommissioning of mining machineries and their possible post mining utilisation, if any, to be described.

4.9 *Safety and Security* : Explain the safety measures implemented to prevent access to surface openings, excavations etc., and arrangements proposed during the mine abandonment plan and upto the site being opened for general public should be described.
4.10 *Disaster Management and Risk Assessment* : This should deal with action plan for high risk accidents like landslides, subsidence flood, inundation in underground mines, fire, seismic activities, tailing dam failure etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such eventualities and the assistance to be required from the local authority should also be described.

4.11 *Care and maintenance during temporary discontinuance* : For every five yearly review (as given in the mining scheme), an emergency plan for the situation of temporary discontinuance or incomplete programme due to court order or due to statutory requirements or any other unforeseen circumstances, should include a plan indicating measures of care, maintenance and monitoring of status of unplanned discontinued mining operations expected to re-open in near future. This should detail item wise status monitoring and maintenance with periodicity and objective.

5. Economic Repercussions of closure of mine and manpower retrenchments :
Manpower retrenchment, compensation to be given, socio-economic repercussions and remedial measures consequent to the closure of mines should be described, specifically stating the following.

5.1 Number of local residents employed in the mine, status of the continuation of family occupation and scope of joining the occupation back.

5.2 Compensation given or to be given to the employees connecting with sustenance of himself and their family members.

5.3 Satellite occupations connected to the mining industry - number of persons engaged therein - continuance of such business after mine closes.

5.4 Continued engagement of employees in the rehabilitated status of mining lease area and any other remnant activities.

5.5 Envisaged repercussions on the expectation of the society around due to closure of mine.

6. Time Scheduling for abandonment : The details of time schedule of all abandonment operations as proposed in para 4 should be described here. The manpower and other resources required for completion of proposed job should be described. The schedule of such operations should also be supplementated by PERT (Programme Evaluation & Review Technique), Bar chart etc.

7. Abandonment Cost : Cost to be estimated based on the activities required for implementing the protective and rehabilitation measures including their maintenance and monitoring programme.

8. Financial Assurance : The financial assurance can be submitted in different forms as stated in Rule 23(F)(2) of Mineral Conservation and Development (amendment) Rules, 2003. In the mine closure plan, the manner in which financial assurance has been submitted and its particulars have to be indicated.

9. Certificate : The above mentioned actions have been taken to be stated clearly in the mine closure plan. A certificate duly signed by the lessee to the effect that said closure plan complies all statutory rules, regulations, orders made by the Central or State Government, statutory organisations, court etc. have been taken into consideration and wherever any specific permission is required the lessee will approach the concerned authorities. The lessee should also give an undertaking to the effect that all the measures proposed in this closure plan will be implemented in a time bound manner as proposed.

10. Plans, Sections etc. : The chapter 1,2,3 and 4 should be supported with Plans and Sections. The Closure Plan may also be submitted depicting photographs, satellite images on compact disc etc. wherever possible.

Corporate Social Responsibility

Corporate Social Responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large.

MULTIPLE CHOICE QUESTIONS

Mine Environment

1. EIA stands for what?
   - a) Ecological Impact Assessment
   - b) Environmental Impact Assessment'
   - c) Environmental Impact Audit
   - d) Environmental Impact Area

2. The stage in which the biological processes is used to purify water in a wastewater treatment plants is called
   - a) secondary sewage treatment
   - b) primary sewage treatment
   - c) wastewater reduction
   - d) biochemical reduction

3. The most serious environmental effect posed by hazardous wastes is
   - a) air pollution.
   - b) contamination of groundwater.
   - c) increased use of land for landfills.
   - d) destruction of habitat.

4. Pollution of water bodies can be controlled by
   - a) releasing industrial effluents into water bodies.
   - b) dumping waste in water bodies.
   - c) treatment of sewage waste before disposal.
   - d) throwing plastic into water bodies.

5. Chlorine is added to water to
   - a) increase germs.
   - b) improve its taste.
   - c) coagulate impurities.
   - d) remove germs.

Answers

1.b 2.a 3.b 4.c 5.d

Material Management

Material Management is concerned with planning, organizing and controlling the flow of materials from their initial purchase through internal operations to the service point through distribution or Material management may also be defined as a scientific technique, concerned with Planning, Organizing &Control of flow of materials, from their initial purchase to destination.

Basic and foremost aim of material management is to get materials

1. In Right quality
2. In Right quantity of supplies
3. At the Right time
4. At the Right place
5. For the Right cost

Purpose of material management is to

a) gain economy in purchasing
b) satisfy the demand during period of replenishment
c) carry reserve stock to avoid stock out
d) stabilize fluctuations in consumption
e) provide reasonable level of client services

Objective of material management may be divided into two categories: Primary & Secondary

Primary Objective is to

1. Purchase quality goods at minimum cost
2. Exercise control over materials
3. Maintain the continuity of production & sales by regular supply of materials
4. Maintain standards of quality
5. Establish good relationships with the suppliers
6. Maintain the efficiency of materials department

Subsidiary objective is to

1. To participate in make or buy decision process
2. To recommend use of substitute materials
3. To be helpful in new product development
4. To be helpful in standardization of products manufactured

Four basic needs of Material management

1. To have adequate materials on hand when needed
2. To pay the lowest possible prices, consistent with quality and value requirement for purchases materials
3. To minimize the inventory investment
4. To operate efficiently

Inventory Control

Inventory: A physical resource that a firm holds in stock with the intent of selling it or transforming it into a more valuable state.
Items carried in inventory can be

a) raw material
b) purchased parts
c) components
d) subassemblies
e) work in progress
f) finished products

Inventory control is done to stock adequate number and kind of stores, so that the materials are available whenever required and wherever required.
Inventories are needed because demand and supply can not be matched for physical and economical reasons. Some other important reasons for carrying inventories in an organization are :

a) To safe guard against the uncertainties in price fluctuations, supply conditions, demand conditions, lead times, transport contingencies etc.
b) To reduce machine idle times by providing enough in-process inventories at appropriate locations.
c) To take advantages of quantity discounts, economy of scale in transportation etc.
d) To decouple operations i.e. to make one operation's supply independent of another's supply. This helps in minimizing the impact of break downs, shortages etc. on the performance of the down stream operations. Moreover operations can be scheduled independent of each other if operations are decoupled.
e) To reduce the material handling cost of semi-finished products by moving them in large quantities between operations.
f) To reduce clerical cost associated with order preparation, order procurement etc

Inventory Costs

In order to control inventories appropriately, one has to consider all cost elements that are associated with the inventories. There are four such cost elements, which do affect cost of inventory.

- **Unit cost**: it is usually the purchase price of the item under consideration. If unit cost is related with the purchase quantity, it is called as discount price.

- **Procurement costs**: This includes the cost of order preparation, tender placement, cost of postages, telephone costs, receiving costs, set up cost etc.
- **Carrying costs:** This represents the cost of maintaining inventories in the plant. It includes the cost of insurance, security, warehouse rent, taxes, interest on capital engaged, spoilage, breakage etc.
- **Stockout costs**: This represents the cost of loss of demand due to shortage in supplies. This includes cost of loss of profit, loss of customer, loss of goodwill, penalty etc.

If one year planning horizon is used, the total annual cost of inventory can be expressed as:

Total annual inventory cost = Cost of items + Annual procurement cost + Annual carrying cost + Stockout co
COST

Inventory Management

Inventory management deals with when to order and how much to order. It aims to minimize the total cost of inventories so as to generate high return.If we hold more than the optimum level of inventory, we are incurring considerable opportunity cost because the funds are tied up in inventories. There are other explicit costs of holding inventory such as storage costs, insurance costs, etc. If we hold too little inventory we might have to place more orders and incur more communication and transportation costs. Then is another category of inventory costs: the stock out of costs. If we are too low inventories we might run out of stock and might not be able to lose sales and customers.

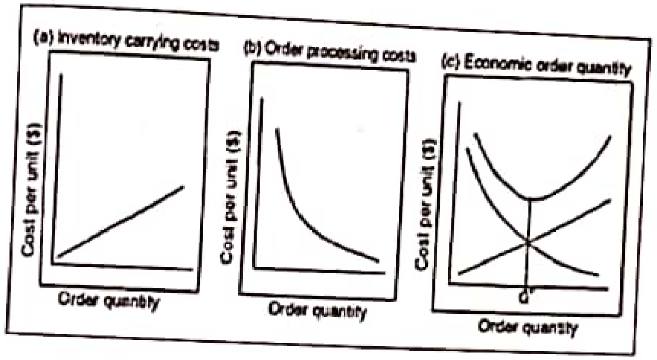
Economic order quantity model is one of the tool which help in minimizing the above mentioned costs.

Economic Order Quantity (EOQ)

Economic order quantity (EOQ) is the order quantity of inventory that minimizes the total cost of inventory management.

Two most important categories of inventory costs are ordering costs and carrying costs. Ordering costs are costs that are incurred on obtaining additional inventories. They include costs incurred on communicating the order, transportation cost, etc. Carrying costs represent the costs incurred on holding inventory in hand. They include the opportunity cost of money held up in inventories, storage costs, spoilage costs, etc.

Ordering costs and carrying costs are quite opposite to each other. If we need to minimize carrying costs we have to place small order which increases the ordering costs. If we want minimize our ordering costs we have to place few orders in a year and this requires placing large orders which in turn increases the total carrying costs for the period.We need to minimize the total inventory costs and EOQ model helps us just do that.



Total inventory costs = Ordering costs + Holding costs

EOQ = sqrt(2 × Quantity × Cost Per Order / Carrying Cost Per Order)

or

EOQ = Average Monthly Consumption X Lead Time [in months] + Buffer Stock – Stock on hand

Example 1

XYZ Ltd. is engaged in sale of bolts. Its cost per order is Rs 400 and its carrying cost unit is Rs10 per unit per annum. The company has a demand for 20,000 units per year. Calculate the order size, total orders required during a year, total carrying cost and total ordering cost for the year.

Solution

EOQ = SQRT(2 × 20,000 × 400/10) = 1,265 units
Annual demand is 20,000 units so the company will have to place 16 orders
i.e 20,000 ÷1,265= 15.81.
Total ordering cost = 400*16 =Rs 6400.
Average inventory held is = (0+1265)/2) = 632.5
which means total carrying costs = 632.5 × Rs10= Rs 6325

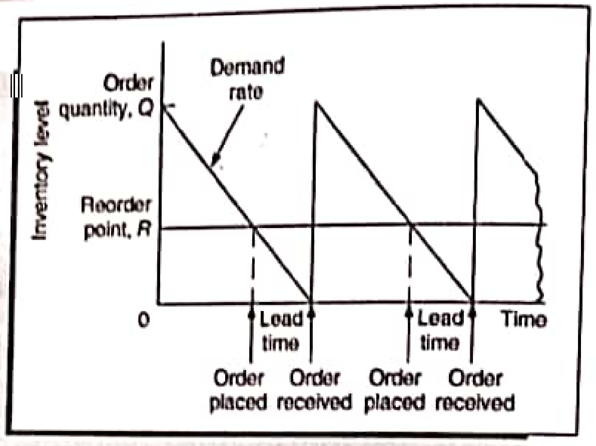
Reorder level

Reorder level (or reorder point) is the inventory level at which a company would place a new order.

Reorder Level = Lead Time in Days × Daily Average Usage + Safety Stock

Lead time is the time it takes the supplier or the manufacturing process to provide the ordered units.
Buffer stock or **'strategic stock'** or **'safety stock'** or **'buffer inventory'** is defined as a supply of inputs held as a reserve to uphold against unanticipated shortages or demands. It is the excess inventory or safety stock, forming a cushion of supply to safeguard during shortages.
Safety stock is calculated using the following formula:

Safety Stock = (Maximum Daily Usage – Average Daily Usage) × Lead me



Example 2
ABC Ltd. is a retailer of tyres. It sells 500 units of one of a famous brand daily. Its supplier takes a week to deliver the order. When should manager place an order in order to avoid stock out ?

Solution
The inventory manager should place an order before the inventories drop below 3,500 units (500 units of daily usage multiplied with 7 days of lead time) in order to avoid a stock-out.

Example 3
From above example ABC Ltd. has decided to hold a safety stock equivalent to average usage of 5 days. Calculate the reorder level.

Soluton –
Safety stock which ABC Ltd. has decided to hold equals 2,500 units (500 units of daily usage multiplied by 5 days).
In this scenario reorder level would be 6,000 units (2,500 of safety stock plus 3,500 units based on 7 days of lead time).

Example 4

XYZ Ltd. is engaged in production of drill rod. It purchases iron rod from PQR Ltd. an external supplier. PQR Ltd. takes 10 days in manufacturing and delivering an order. XYZ's requires 10,000 units of iron rod . Its ordering cost is Rs1,000 per order and its carrying costs are Rs 3 per unit per year. The maximum usage per day could be 50 per day. Calculate economic order quantity, reorder level and safety stock.

Solution

EOQ = SQRT (2 × Annual Demand × Ordering Cost Per Unit / Carrying Cost Per Unit)

Maximum daily usage is 50 units and average daily usage is 27.4 (10,000 annual demand + 365 days).

Safety Stock = (50-27.4) × 10 = 226 units.

Reorder Level = Safety Stock + Average Daily Usage × Lead Time

Reorder Level = 226 units + 27.4 units × 10 = 500 units.

ABC ANALYSIS

This is based on cost criteria. It helps to exercise selective control when confronted with large number of items it rationalizes the number of orders, number of items & reduce the inventory.The ABC principle is based on the observation that a small number of items often dominate the results achieved in any situation. This observation was first made by an Italian economist, Vilfredo Pareto, and is called Pareto's law.

As applied to inventories, it is usually found that the relationship between the percentage of items and the percentage of annual dollar usage follows a pattern in which three groups can be defined:
Group A About 20% of the items account for about 80% of the total cost.
Group B About 30% of the items account for about 15% of the total cost.
Group C About 50% of the items account for about 5% of the total cost.
The percentages are approximate and should not be taken as absolute. This type of distribution can be used to help control inventory.

Different controls used with different classifications might be the following:

•A items:

a) high priority
b) tight control including complete accurate records
c) regular and frequent review by management
d) frequent review of demand forecasts and
e) close follow-up and expediting to reduce lead time.

• B items:

a) medium priority
b) normal controls with good records
c) regular attention, and
d) normal processing.

• C items:

a) lowest priority
b) simplest possible controls—make sure there are plenty
c) simple or no records; perhaps use a two-bin system or periodic review system.
d) order large quantities and carry safety stock.

ABC analysis does not stress on items those are less costly but may be vital

VED ANALYSIS

Based on critical value & shortage cost of an item – It is a subjective analysis.

- Items are classified into:

Vital: Shortage cannot be tolerated.
Essential: Shortage can be tolerated for a short period.
Desirable: Shortage will not adversely affect, but may be using more resources.

MULTIPLE CHOICE QUESTIONS

Material Management

1. In inventory control theory, the economic order quantity is
   a) capacity of a warehouse
   b) optimum lot size
   c) lot size corresponding to break-even analysis
   d) average level of inventory
2. Probabilistic time for completion of any activity can be found out from
   a) most likely time
   b) optimistic time
   c) pessimistic time
   d) all of these
3. VED analysis of inventory management stands for
   a) Vital-Essential-Desirable
   b) Valuable-Easy-Difficult
   c) Very-Essentially-Desired
   d) Valuable-Effective-Difficult to obtain
4. Materials management is also called__________
   a) Distribution planning
   b) Control and logistics management
   c) Both of the above
   d) Neither of the above
5. "C" items in ABC analysis are:
   a) reviewed frequently.
   b) particularly critical in financial terms.
   c) normally carried in small quantities.
   d) ordered frequently.
6. Which of the following is not an inventory?
   a) Machines
   b) Raw material
   c) Finished products
   d) Consumable tools
7. The following classes of costs are usually involved in inventory decisions except

a) Cost of ordering
b) Carrying cost
c) Cost of shortages
d) Machining cost

8. 'Buffer stock' is the level of stock

a) Half of the actual stock
b) At which the ordering process should start
c) Minimum stock level below which actual stock should not fall
d) Maximum stock in inventory

9. The minimum stock level is calculated as
a) Reorder level – (Normal consumption x Normal delivery time)
b) Reorder level + (Normal consumption x Normal delivery time)
c) (Reorder level + Normal consumption) x Normal delivery time
d) (Reorder level + Normal consumption) / Normal delivery time

10. Which of the following is true for Inventory control?

a) Economic order quantity has minimum total cost per order
b) Inventory carrying costs increases with quantity per order
c) Ordering cost decreases with lo size
d) All of the above

11. The time period between placing an order its receipt in stock is known as
a) Lead time
b) Carrying time
c) Shortage time
d) Over time

12. Re-ordering level is calculated as
a) Maximum consumption rate x Maximum re-order period
b) Minimum consumption rate x Minimum re-order period
c) Maximum consumption rate x Minimum re-order period
d) Minimum consumption rate x Maximum re-order period

13. The Economic Order Quantity (EOQ) is calculated as
a) (2D*S/h)^1/2
b) (DS*/h)^1/2
c) (D*S/2h)^1/2
d) (D*S/3h)^1/2

Where, D=Annual demand (units), S=Cost per order, h=Annual carrying cost per unit

14. The order cost per order of an inventory is Rs. 400 with an annual carrying cost of Rs. 10 per unit. The Economic Order Quantity (EOQ) for an annual demand of 2000 units is
a) 400
b) 440
c) 480
d) 500

Answer

1.b 2.d 3.a 4.c 5.d 6.a 7.d 8.c 9.a 10.d 11.a 12. 13.a
14.a

Practice Paper-I

1. At what intervals re-railers shall be placed?
   a) 10 m
   b) 200 m
   c) not more than 250 m ✓
   d) not less than 30 m
2. Length of cable shall not be less than ________ in cut blasting ?
   a) 18 m ✓
   b) 20 m
   c) 30 m
   d) of two right angle of pillar size.
3. For how many days sleeping holes may not be blasted in case of a mine using dragline ?
   a) only for one shift
   b) 24hrs.
   c) 7 days
   d) 15 days ✓
4. What type of fencing shall be provided at Working Shaft ?
   a) S2
   b) U2
   c) G1 ✓
   d) U1
5. Point load index of certain type of rock obtained from field was 20Kg/cm^2.What will be its compressive strength(Kg/cm^2)? $I = \frac{P}{D^2}$
   a) 200 ✓
   b) 240
   c) 14
   d) Data insufficient
6. Appeal to Chief Inspector against order of RI under CMR 2017 can be made within______days?
   a) 10
   b) 20
   c) 30
   d) 15 ✓
7. RMR of two strata of thickness 5m and 15m are 20 and 40 respectively. What is the combined RMR of the system ? $\frac{T_1 R_1 + T_2 R_2}{T_1 + T_2}$
   a) 3
   b) 25
   c) 35 ✓
   d) 60
8. Notice of extraction of coal by method other than Board & pillar system is sent to ___?
   a) Only RI
   b) Only CI
   c) Both RI and CI ✓
   d) Either of them
9. Information regarding Reportable injury shall be sent to CI &RI immediately when persons involved are equal to or more than____?
   a) 4
   b) 5 ✓
   c) Irrespective of number of persons
   d) Never sent
10. What should be the maximum plotting errors of a plan made on 1:2000 scale ?
    a) 10 cm
    b) 50 cm ✓
    c) 25 cm
    d) 5 cm
11. Which cut is used for solid blasting in Indian coal Mines ?
    a) Fan cut
    b) burn cut
    c) wedge cut ✓
    d) drag cut
12. While blasting in hot strata the temperature of hole should not exceed
    a) 50^0 c
    b) 60^0 c
    c) 70^0 c
    d) 80^0 c ✓
12. While dealing with Misfire in underground shot the relieving hole is drilled at a distance not less than
    a) 10 cm
    b) 20cm
    c) 30 cm ✓
    d) 40 cm
13. As per CMR the recapping of rope is done once at least in every
    a) 3 month
    b) 4 months
    c) 6 months ✓
    d) 1 year.
14. keps are used in
    a) Koepe winding
    b) Direct haulage
    c) Endless haulage ✓
    d) Drum winding
15. When working approaches a waterlogged areas , apparatus used as precautionarymeasure is
    a) Diamond drilling
    b) Burn side boring
    c) Jackhammer drilling
    d) Chilled shot drilling
16. For overburden removal with shovel dumper combination the optimum size of the dumper depends on
    a) The distance of the haul
    b) Size of the shovel

c)Size of the shovel and the distance of haul
d) Tonnage to be handled

17. Guide rope should be inspected at an interval not more than
   - a) 7 days
   - b) 15 days
   - c) 30 days
   - d) 3 months

18. If death has been caused by heart failure in any mining operation then OAM shall submit ________ to DGMS in
   - a) Form 4-A
   - b) Form 4-A with post-mortem report
   - c) Only post-mortem report
   - d) Form 4-C

19. Minimum quorum for pit safety committee is
   - a) 40%
   - b) 60%
   - c) 50%
   - d) 80%

20. Notice of change in ownership of mine is given in?
   - a) Form 2-B
   - b) Form 2-C
   - c) Form 1-A
   - d) Form 4-A

21. No caving is permitted when the thickness of hard cover is less than ?
   - a) 15 m
   - b) 7.5 m
   - c) 10 m
   - d) 12 m

22. Cage shall be examined once in every
   - a) 3 month
   - b) 6 month
   - c) 1 month
   - d) 12 month

23. To guard against danger of air blast the minimum opening left in isolation stopping is
   - a) 1.5 mx1.5 m
   - b) 1.8 mx1.8 m
   - c) 1.5 mx1.5 m
   - d) 2 m x 2 m

24. Guide rope tension upto 500 depth is
   - a) 1.25 te/100m
   - b) 8.25 te/100m
   - c) 6.25 te/100m

   - d) 2.25 te/100m

25. When roof is poor then roof bolt density should be
   - a) 1.25-1.5 bolt/m^2
   - b) 1 bolt/m^2
   - c) 0.75 bolt/m^2
   - d) 0.8 bolt/m^2

26. A coal mine's monthly production is 25,000 te . A manager to be appointed at that mine shall be holding first class certificate and should have minimum experience of______?
   - a) 2 years
   - b) 5 years
   - c) 6 years
   - d) 4 years

27. In auxiliary fan % of methane in intake air shall not be more than
   - a) 0.75 %
   - b) 0.50 %
   - c) 0.3 %
   - d) 1.25 %

28. Length of roof bolt shall not differ from the design length more than
   - a) ±10 mm
   - b) ± 5 mm
   - c) ± 15 mm
   - d) ± 8 mm

29. Constituent of stemming material is
   - a) 30% clay , 70 % sand
   - b) 70% clay , 30 % sand
   - c) 50% clay , 50 % sand
   - d) 20% clay , 80 % sand

30. Life of fire resistance fluid is
   - a) 1 year
   - b) 2 year
   - c) 3 year
   - d) 4 year

31. Life of sensor used in local methane detector shall be at least
   - a) 1 year
   - b) 2 year
   - c) 3 year
   - d) 4 year

32. In local methane detector, sensor shall operate satisfactorily at a temperature upto______and relative humidity of upto ______?
   - a) 30°C , 50 %
   - b) 40°C , 60 %
   - c) 50°C , 100 %

d) 60°C , 50%

33. Maximum speed of dumper is restricted to
- a) 20Km/h
- b) 30 Km/h
- c) 40 Km/h
- d) 25 Km/h

34. In a first degree mine post of ventilation officer has been combined with that of safety officer.The production of that mine must be less than____tonne ?
- a. 600
- b. 2500
- c. 5000
- d. 15000

35. Average monthly output of a mine is 16000te . What shall be the minimum number of safety officers to be there to assist the manager in carrying out safety practices?
- a. 1
- b. 2
- c. 3
- d. 4

36. Off-set plans have to be maintained on a scale having representative factor of ________?
- a. 2000:1
- b. 1000:1
- c. 1200:1
- d. 500:1

37. Distance between shafts of mine may be ________?
- a. 10m
- b. 15m
- c. 13m
- d. 10.5 m

38. What shall be the safe gaps between cage and landing levels in winding shaft when rail guide with shoes is used?
- a. 50 mm
- b. 65 mm
- c. 90 mm
- d. 75 mm

39. Heavy duty winding engine is the engine which works for more than ______hour in a shift ?
- a. 6
- b. 3.5
- c. 10
- d. 8

40. RMR of a pillar is 25. What should be the Threshold values of vibration(PPV) so that pillar remains safe ?
- a. 25 mm/s
- b. 30 mm/s
- c. 20 mm/s
- d. 30-40 mm/s

41. Callibration of Methanometer shall be done in every______months ?
- a. 1
- b. 3
- c. 6
- d. 12

42. Notice has to be sent forthwith to RI if percentage of inflammable gas exceeds______% ?
- a. 1.25
- b. 0.5
- c. 0.75
- d. 2

43. Thickness of a ventilation stopping of mine as per DGMS circular may be _____?
- a. 40 cm
- b. 30 cm
- c. 25 cm
- d. 37 cm

44. Maximum air velocity in ventilation shafts where man-winding is not carried out should be ________m/s?
- a. 12
- b. 15
- c. 8
- d. 6

45. The maximum permitted inclination to horizontal to work without safety-belt or life-line or other safe-guard is
- a) 30 degree
- b) 37.5 degree
- c) 45 degree
- d) 60 degree

46. In an underground coal mine the place where explosive is stored in underground is called as
- a) Reserve station
- b) Shelter
- c) Magazine
- d) None of the above

47. Notice to regional inspector of mines about occurrence of serious accident is givenin
- a) Form-4 A
- b) Form-4 B
- c) Form-4 C
- d) Form-5

48. Flexible cable must have flexible armouring if
- a) Conductivity not more than 75% of largest conductor
- b) Conductivity not more than 25% of largest conductor
- c) Conductivity not more than 50% of largest conductor
- d) Conductivity not more than 80% of largest conductor

49. Installation of booster fan in one district
- a) Reduces the flow of air in other district
- b) Increases the flow of air in other district
- c) Reduces the resistance of other district

d) None of the above

50. Which of the following power a committee may exercise ?
- a) Exercise power of inspector.
- b) Make rules and regulations
- c) Enquiry into accident .
- d) All

52.Who can appoint officer in charge of canteen ?
- a) Manager
- b) Owner/agent
- c) Chief Inspector
- d) Regional Inspector

53. Who can become chairman of committee constituted under section 12 of mines act 1952 ?
- a) Any central govt. officer
- b) Chief Inspector
- c) Director of govt. institute
- d) All

54. Continuous miner can be recommended in gradient of.......?
- a)1/5
- b)1/7
- c)flatter than 1/7.
- d) both b nd c

55.Electrical power shall be used at a mine shall be at a voltage not more than ?
- a) 6600V
- b) >6600V
- c) <11000V
- d) >11000V

56.Pneumoconiosis is caused by breathing
- a) Air borne dust
- b) Air borne dust containing free silica
- c) Air borne dust containing more than permissible limit of silica
- d) All

57.Portable apparatus is the apparatus, which
- a) Can move while in operation
- b) Can not move while in operation
- c) Is light in weight
- d) Which can be handheld

58.Terms of chairman of committee constituted under section 12 of mines act 1952 is
- a) 3 years
- b) 2 years
- c) 5 years
- d) 1 year

59. According to which Section of Mines Act-1952 the provision on occupational health survey is done ?
- a) 9
- b) 9 A
- c) 10
- d) 11

60.What should be the minimum floor area of a shelter in a mine ?
- a) 10^2 mtrs
- b) 12^2 mtrs
- c) 14^2 mtrs
- d) 15^2 mtrs

61.Power Factor can be improved by –
- a) Using capacitor.
- b) Using synchronous motor.
- c) a & b
- d) None of above

62.Which safety conference is recommended that a new strategies should be planned to achieve the goal of Zero Accident Potential (ZAP) ?
- a) First safety conference
- b) Second safety conference
- c) Third safety conference
- d) Fourth safety conference

63.Which notified disease notified under section 25 of The Mines Act-1942 also notified under Factory Act ?
- a) Silicosis.
- b) Asbestosis.
- c) Noise Induced Hearing Loss.
- d) Manganese Poising.

64.Which occupational disease is notified under section 25 of The Mines Act-1952 after 10th National Safety Conference ?
- a) Silicosis.
- b) Asbestosis.
- c) Noise Induced Hearing Loss.
- d) Manganese Poising .

65.In which form record of inspection done by workmen inspector is kept
- a) Form U
- b) Form R
- c) Form S
- d) Form T

66.Establishment of strata control cell was recommended in which National Safety Conference ?
- a) 7th
- b) 8th
- c) 9th

d) 10th

67.Dosimetry has been recommended to be used by individual where the noise level exceeds?

a) 85 dB(A)
b) 90 dB(A)
c) 115 dB(A)
d) 140 dB(A)

68.As an Inspector District Magistrate may not exercisethe Powers conferred by sections

a) 22
b) 22 A
c) 61
d) All the above

69.The purpose of safety stock is to

a) replace failed units with good ones
b)eliminate the possibility of a stockout
c) eliminate the likelihood of a stockout due to erroneous inventory tally
d) control the likelihood of a stockout due to the variability of demand during lead time

70. A rescue brigade shall consist of at least _____ rescue trained person.

a) 12
b) 18
c) 20
d) 16

71.Equipment should be kept according to schedule_______ in first aid room.

a) First
b) Second
c) Third
d) Fourth

72.A person declared medically unfit during periodical medical examination may appeal to _____ for medical re-examination ?

a) Manager
b) Medical board
c) Chief inspector
d) committee

73.A Project's optimistic,Pesimistic &Most likely time is 2,4 & 6 days.What is the expected time for that poject?

t_o a t_p b t_m

$\frac{a+4m+b}{6}$

a) 5
b) 12
c) 4
d) 6

74.A creche means a room or rooms with ancillary accomodation reserved for the use of children under__________years of age of women employed in mine?

a) 3
b) 4
c) 5
d) 6

75. An industry is selling a product for Rs. 10 per unit. The fixed cost for assets is Rs. 40000 with variable cost of Rs. 6 per unit. How many units should be produced to break even?

$\boxed{X = \frac{FC}{V - X}}$

a) 8,000
b) 10,000
c) 12,000
d) 14,000

76. Which of the following option best describe the EIA process?

a) Screening,Impact Analysis,Scoping,EIA Report
b) Scoping,Screening,Impact Analysis,EIA Report
c) Screening,Scoping,Impact Analysis,EIA Report
d) Impact Analysis,Screening,Scoping,EIA Report

77.What can be the maximum rope speed (m/s)during man-winding ?

a) 1.5
b) 12
c) 2.5
d) 2

78.Who proposed the four principles of scientific management?

a) Herbert Simon
b) Daniel Katz
c) Robert Kahn
d) Frederick Taylor

79.In a time study following datas were collected

Observed time = 10 minutes
Performance rating = 0.90
Allowance factor = 0.25

What will be the standard time of the task?

a) 12 minute
b) 9 minute
c) 10 minute
d) 11.15 minute

80.Annual return of a mine of preceding year shall be submitted on or before _____ of every year.

a) 1st February
b) 14th January
c) 30th April
d) 31st October

Practice Paper-II

1.Increased safety type'e' electrical apparatus is used in degree__________mines?
- a) 1
- b) 2
- c) 3
- d) Both degree 2 & 3

2.Dust incharge may be entrusted with other duties if monthly output of mine is less than__________te/month?
- a) 15000
- b) 10000
- [✓ c) 5000]
- d) 2500

3.Permission to work below any river,canal shall be taken under _____section of CMR?
- a) 149
- b) 126
- c) 136
- d) 125

10

4.pilferage of explosive means
- a)use of explosive belowground
- b)use of explosive in O/C mines
- [✓ c)theft of explosive]
- d)transport of explosive in slurry form

5.Percentage of inflammable gas in mine producing coal 72te per day was found to be 0.5.Quantity of air flowing in the mine is 300cubic meter per minute. What is the degree of mine
- a) 1st
- b) 2nd
- c) 3rd
- d) Data insufficient

6.A mine roof have RMR 40.A continuous miner is planned to be deployed there what will be the adjusted RMR of the roof in this case?
- a) 44
- b) 40
- c) 28
- d) 36

7. A ventilation district producing 160te daily employs 50 person in the largest shift .What should be the quantity of air in cubic meter per minute requiredfor adequate ventilation?
- a) 300
- b) 400
- c) 6
- d) 2.5

8.Work study is also recognised as
- a) Time study
- b) Motion study

- c) both 'a' and 'b'
- d) None of the above

9.Permitted explosives are safe to use because
- a. They have less strength
- b. they have low velocity of detonation
- c. 'they do not produce much noise during blasting
- d. special chemical are used to extinguish the spark produced during blasting.

10. Burden is the distance between
- a. Two blast holes in same row
- b. distance between two rows
- c. distance between first row of blast holes and bench
- d. none of the above

11. To measure the performance of blasting which factor is calculated
- a) Tonnage factor
- b) space factor
- c) stripping ratio
- d)Powder factor

12. What is the formula for blast ability?
- a) B = c / t
- b)B= t / c
- c) B = c + t
- d) B = c X t

13. Reportable injury means any injury other than serious bodily injury, which involvesthe enforced absence of injured person from work for a period of ---------?
- a. 24 hours or more
- b. 36 hours or more
- c. 48 hours or more
- d. 72 hours or more

14. Roof falls are more common if the face is at
- a. Right angles to the main cleat
- b. Parallel to the main cleat
- c. 60 degrees to the main cleat
- d. None of the above

15. What is risk?
- a) Negative consequence that could occur
- b) Negative consequence that will occur
- c) Negative consequence that must occur
- d) Negative consequence that shall occur

16. A seam is worked at a depth of 70 mtrs . from surface and the width of the galleries is 3.2 mtr the dimension of the pillar should not exceed
- a. 15.0 mtrs
- b. 16.5 mtrs
- c. 19.5 mtrs
- d. 13.5 mtrs

17. RQD is a quantitative index based on core recovery procedure which is determined by incorporation of only those pieces of core that are
- a) Less than or equal to 100mm

b) Greater than or equal to 100mm
c) Less than or equal to 125mm
d) Greater than or equal to 125mm

18. What is the recommended instrument for the air borne respirable dust sampling in the Indian mines ?
a. RAM-I
b. Konimeter
c. NCB/MRE-113A
d. CLP-10

19. What is the periodic interval of an exploder to be over hauled ?
a) At least in a week.
b) At least in a month.
c) At least in two months.
d) At least in three months

20. According to DGMS, original mine plan should be prepared on durable sheet of?
a) Cotton
b) Polyester
c) Cotton rug
d) Linen

21. If the dust survey conducted shows the result 75% , the subsequent survey shall be carried on an interval not exceeding
a. one month
b. two months
c. three months
d) four months

22. Quantity of drinking water provided at a scale of 3 litre for every person at one time when wet bulb temperature exceeds ________degree?
a) 30
b) 30.5
c) 33.5
d) 50

23. How many types of brakes are there in dumper?
a) 3
b) 5
c) 4
d) 2

24. A common definition of Organizational Behaviour is that it is the study of:
a) Group behavior
b) Individual behavior
c) Patterns of organizational structure
d) All of the above

25. In koepe winding system fleet angle is
a) 1.5^0
b) 2^0

c) 1^0
d) None

26. OEM shall examine Local methane detector in totally at least once in every
a) 3months
b) 12months
c) 6months
d) 18months

27. Which type of fencing is provided on top of abandon shaft ?
a) U_1
b) S_1
c) G_1
d) S_2

28. When depth of shaft is 600 m than maximum man winding speed is
a) 4 m/s
b) 8 m/s
c) 7 m/s
d) 12 m/s

29. If shaft is in wet condition than which type of rope is used?
a) Locked coil rope
b) Flattened strained rope
c) Galvanized rope
d) Spinning rope

30. Examination of winding rope is carried out once in a
a) Week and every 30 days
b) 30 days and 3 months
c) Week and 3 months
d) 15 days and every 30 days

31. Factor of safety of winding rope in deep shaft is
a) 10
b) 9
c) 8
d) 5 or 6

32. For gas survey in degree 1 mines determination of general body of air shall be made once at least in
a) 15 days
b) 30 days
c) 3 months
d) 7 days

33. Filter paper used for a particular sampling shall be preserved atleast for a period of 3 years.
a) 2 years
b) 6 months

c) 3 months
d) 3 years

34. The following assumptions are made in case of break even analysis, except
a) All fixed costs are fixed
b) All variable costs are fixed
c) The prices of input factors are constant
d) Volume of production and volumes of sales are equal

35. local methane detector shall be installed in
a) Intake air
b) Return air
c) Working face
d) Near goaf

36. In local methane detector noise level of audio visual alarm shall be at least
a) 70 dB
b) 80 dB
c) 90 dB
d) 85 dB

37. Frequency of calibration of sensor of tele-monitoring system shall not exceed
a) 1 month
b) 3 months
c) 2 months
d) 6 months

38. Stability test of HEMM shall be carried out at least once in
a) 1 year
b) 2 year
c) 3 year
d) 4 year

39. A manager's permit is provided to Overman ,when monthly average output of mine is not more than_____tonne?
a. 600
b. 1000
c. 2500
d. 1500

40. A surveyor can work for more than one mine when average monthly output of the mine does not exceed_______tonne ?
a. 600
b. 2500
c. 15000
d. 10000

41. Check survey shall be done when Working has approached _____m from water body.
a. 60
b. 90

c. 120
d. 75

42. Geological plans have to be maintained on a scale having representative factor of _______?
a. 2000:1
b. 1000:1
c. 1200:1
d. 5000:1

43. Distance between shafts of mine may be _________m ?
e. 10m
f. 15
g. 13
h. 10.5

44. What shall be the safe gaps between cage and landing levels in winding shaft when rail guide with roller is used?
a.50 mm
b.65 mm
c.90 mm
d.75 mm

45. Medium duty winding engine is the engine which works _____hour in a shift ?
a. Less than 3
b. 1.5- 3.5
c. More than 3.5
d. 8

46. RMR of a roof is 25. What should be the Threshold values of vibration(PPV) so that roof remains safe ?
e. 25 mm/s
f. 30 mm/s
g. 20 mm/s
h. 30-40 mm/s

47. Minimum Illumination(lux) in operational area of drills should be ?
a. 5
b. 10
c. 3
d. 0.3

48. No energized electric cables are allowed to pass within the distance of _____m from the reserve station.
a. 50
b. 75
c. 90
d. 110

49. Factor of safety in connection with winding is
a) Applicable to dynamic loading
b) Applicable to static loading

c) Assumes a constant value

[✓ d) Varies with respect to time]

50. All result of measurements of airborne repairable dust and all other relevant particulars shall be systematically recorded within

✓ a) fourteen days of the date of collection of samples.
b) seven days of the date of collection of samples.
c) fifteen days of the date of collection of samples.
d) one month of the date of collection of samples.

51.Flexible cable may have

a) Single core
b) Double core
c) Multi core
d) All

52.Parallel winding is used for making

a) Flame proof apparatus
b) 'e' type safety apparatus
c) Intrinsically safe apparatus
d) Earthing system

53.If voltage is more than 15000V than it falls in

a) Low voltage
b) Medium voltage
c) High voltage
d) Extra high voltage

54.How many days in a week workmen inspector performs the duty of workmen inspector ?

a) 5
b) 4
c) 3
d) 2

55.Workmen inspector writes his inspection report in Form______?

a) Q
b) U
c) T
d) S

56.Distance between two first aid room must be at least

a) 300m
b) 100m
c) 50m
d) 400m

57.In depillaring operation if crushing of pillar exists than inspector prohibit the employment under section______of mines act 1952?

a) 22

b) 22A
c) 5
d) 56

58.Who are the member of court of enquiry ?

a) Chief inspector
b) Competent person
c) Mining Expert
d) Competent person and Mining expert

59.Overhead lines must have clearance over haul road________?

a) 10m
b) 12m
c) 3m
d) 15m

60. Productivity of a mine is defined as

a) Total production in a year
b) Total production per day
c) Production per head in a shift
d) None

61. Who gives notice of date of meeting of committee constituted under section 12 of mines act?

a) Secretary
b) Chairman
c) Manager
d) Any member can give

62.In any mine where 5 or more than 5 reportable accident occurs than it is necessary to send information to

a) DGMS
b) District Magistrate
c) Not necessary
d) Owner

63.In case of defective machinery inspector may prohibit employment in Underground mine under section

a) 22
b) 22A
c) 56
d) 57

64.Floor area of first aid room is

a) 10 m^2
b) 15 m^2
c) 14 m^2
d) 110 m^2

65.No person shall be allowed to enter in area where noise level exceeds

a) 115 dB

b) 130 dB
c) 140 dB
d) 90 dB

66. Which of these is not a principle of great man theory?
a) Leaders are born not made.
b) Great men rise up in times of crisis.
c) We can learn from the biographies of great leaders.
d) A great leader is only great in certain situations

67.Time interval between placement of order and supply of order is called
a) Cycle time
b) Lead time
c) Lag time
d) Frequency

68.Who sets up court of enquiry
a) DGMS
b) Central govt.
c) State govt.
d) Owner of mine

69.Appelate medical board is constituted under section______of Mine Rules 1955.
a) 29 K
b) 29 B
c) 29 J
d) 29 L

70.800 persons are employed in a belowground mine. In such mine how many person shall be rescue trained ?
a) 5
b) 6
c) 8
d) 9

71.Man riding system was recommended in which National Safety Conference?
a) 9th
b) 10th
c) 8th
d) 11th

72.The following subject(s) is (are) related to 'Ergonomics'
a) Anthropology
b) Physiology
c) Psychology
d) All of the above

73.In the basic EOQ model, if the cost of placing an order doubles, and all other values remain constant, the EOQ will
a) increase by about 41%

b) increase by 100%
c) increase by 200%
d) either increase or decrease

74.A mine has been declared an accident prone. Severity index of that mine may be ?
a) 10
b) 15
c) 9
d) 8

75.According to 7th National Safety Conferencerecommendation traffic rule should be approved by?
a) Manager
b) Owner
c) Tripartite Committee
d) Bipartite Committee

76.The systems approach ______________?
a) Encourages managers to view the organisation both as a whole and as part of a larger environment
b) Emphasises the psychological and social aspects
c) Emphasises the technical requirements of the organisation and its needs
d) All of the above
e) None of the above

77. A company wishes to determine the EOQ for an item that has an annual demand of 2,000 units, a cost per order of Rs 500, and annual carrying cost of Rs 50 per unit. What is the EOQ?
a) 200
b) 100
c) 50
d) 400

78.Which of the following items shall be shown in an electrical Plan ?
I. Fixed Apparatus & Conductors
II. Cables
III. Signalling lines
IV. Portable apparatus
a) I
b) I & II
c) I, II & III
d) All

79.There are two sound source at a place in a mine with 90dB and 94 dB. What is the equivalent sound pressure level (dB)?
a) 96
b) 184
c) 92
d) 94

80.Total contribution margin is equal to_________?
I. Total sale+Total Variable Cost

II. Total sale - Total variable cost
III. Fixed Cost+Profit
IV. Fixed Cost-Profit
a) I
b) II
c) I & III
d) II & IV

ANSWERS

Practice Paper-1

1.c 2.a 3.d 4.c 5.a 6.d 7.c 8.c 9.b 10.b 11.c 12.d
13.c 14.c 15d . 16.b 17.c 18.c 19.c 20.a 21.a 22.b 23.b 24.c
25.a 26.a 27.b 28.c 29.b 30.a 31.a 32.c 33.c 34.b 35.d 36.a
37.d 38.b 39.a 40b 41.a 42.b 43.c 44.a 45.a 46.c 47.a 48.a
49.b 50.a 51.a 52.b 53.a 54.d 55.b 56.c 57.a 58.a 59.b 60.c
61.c 62.d 63.c 64.c 65.b 66.d 67.a 68.d 69.d 70.b 71.b 72.a
73.a 74.d 75.b 76.c 77.b 78.d 79.a 80.d

Practice Paper-2

1.c 2.b 3.a 4.b 5.b 6.b 7.b 8.c 9.d 10.c 11.d 12.a
13.d 14.b 15.a 16.b 17.b 18.c 19.d 20.b 21.a 22.b 23.b 24.d
25.d 26.c 27.d 28.c 29.c 30.a 31.d 32.b 33.d 34.b 35.b 36.d
37.b 38.a 39.a 40.b 41.c 42.d 43.b 44.b 45.b 46.c 47.b 48.c
49.b 50.b 51.d 52.c 53.c 54.d 55.c 56.a 57.b 58.d 59.b 60.d
61.a 62.a 63.b 64.a 65.c 66.d 67.b 68.b 69.a 70.c 71.d 72.d
73.a 74.b 75.c 76.a 77.a 78.a 79.a 80.d

Frequently Asked Interview Questions

1. What all factors do you consider while designing a panel in depillaring operation?
2. Why date of local fall is recorded?
3. What is incubation period
4. Being a manager of an opencast mine how will you work near a river?
5. As a manager of open cast mines what all precautions will you take while working near road?
6. What is safety management plan of your mines?
7. What is systematic support rule of your mine?
8. What is ERP?
9. How will you control inventory of your mine?
10. What is the best method that can be practiced in case of open cast mine for higher production?
11. Difference between seriously body injury and reportable injury?
12. A worker's hand got fractured while drilling. What type of injury will it be considered?
13. How do you prepare for monsoon?
14. What is traffic rules of your mine?
15. What is difference between deemed agent and agent?
16. Difference between 22 and 22A of Mines Act'1952.
17. What is revenue pillar?
18. What is safe haven?
19. What is risk assessment?
20. How will you open an open cast mine?
21. What are the permission required before opening an open cast mine?
22. By looking at the apparatus how can you conclude whether it is flameproof or intrinsically safe apparatus? Explain with example
23. What is spontaneous heating ?
24. What are the latest technologies for detecting mine gases?
25. As a manager what will you do in case of a serious bodily injury to your worker?
26. How do you carry out dust survey ?
27. What are the major problems faced by an open cast mines?
28. What all qualities a leader should have?
29. What is a human factor ?
30. OMS of your mines and the method to calculate it.
31. How can you increase the production of your mine with current resources?
32. How can you increase the production of your mine with new technologies?

Interview Tips

Important topics that must be covered before appearing for interview

- **Important definition:-**
    - ➢ Incubation Period
    - ➢ Ignition Temperature
    - ➢ Crossing point temperature
    - ➢ Grahm's ratio
    - ➢ Willet ratio
    - ➢ John Trickket ratio
    - ➢ Angle of draw
    - ➢ Factor of safety
    - ➢ Cavability index
    - ➢ Faults & its type
    - ➢ Folds & its type
    - ➢ protodyakonov index
    - ➢ fly rock
    - ➢ power factor
    - ➢ powder factor
    - ➢ detonator factor
    - ➢ stripping ratio
    - ➢ danger zone
    - ➢ peak particle velocity(PPV)
    - ➢ Velocity of Detonation (VOD)

Construction specification of :

i. Isolation stopping
ii. Explosion proof stopping
iii. Water dam

Get all the details of your mine

- ➢ History , geological features, structures etc.
- ➢ Seam thickness, dip, strike length, degree of seam.
- ➢ Grade of coal
- ➢ Highest Flood Level
- ➢ Mine plan
- ➢ Had ever sec 22 or 22A of Mines act applied to your mine.
- ➢ Stripping ratio

- ➢ Powder factor
- ➢ Blasting method
- ➢ Production target

- How to do mining in Thick coal seam?
- What is blasting gallery method ?
- What is solid blasting ?
- Explain longwall method of working.
- Lighting standard in Open cast & Underground Mines.
- Permissible limit of Mine Gases.
- Coward's diagram.
- How will you carry out induced caving ?
- Explain over riding of pillars.
- Methods of control blasting.
- Schedule II of CMR
- Explain procedures for risk assessment, safety management system.
- Suitable working gradient for LHD, SDL, Continuous miner.
- What all measures shall be taken to prevent air blast?
- What all precaution shall be taken in wake of air blast ?
- Safety features in winding ,conveyor belts.
- Duties of :

    i. Manager
    ii. Safety Officer
    iii. Ventilation Officer
    iv. Overman
    v. Mining sirdar
    vi. Assistant manager
    vii. Surveyor

- Difference between:

    i. Auxiliary fan & Booster fan
    ii. Serious bodily injury & Reportable injury
    iii. True dip & Apparent dip
    iv. Local fall and main fall
    v. RMR & RQD
    vi. Flame proof & Intrinsically safe apparatus

- Problems faced in working in

    i. Thick seam
    ii. Longwall advancing method

iii. Near highwall in case of open cast mine.
iv. Near river/ public road in case of open cast mine

FIRST/SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY(RESTRICTED)

(UNDER COAL MINES REGULATIONS, 2017)

MINE MANAGEMENT, LEGISLATION AND GENERAL SAFETY

MINE MANAGEMENT:

Introduction: Evolution of management; theory and practice; principles of scientific management; elements of management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management: Selection, training and development of human resources for mining enterprises; leadership;study of traditional leader behaviour; autocratic, democratic and Laissez-Faire behaviours.

Production Management: Determination of norms and standards of operations by work study, analysis of mine capacities and capability; production planning, scheduling and control; short term and long term planning; productivity; concepts and measurements; application of Ergonomics in mine operation.

Financial Management: Capital budgeting techniques for mining project, project evaluation; payback period and IRR;methods of cost analysis and cost control; break-even charts; working capital management.

Mining Environment: EIA (Environment Impact Assessment), EMP(Environment Management Plan), ETP (Effluent Treatment Plant), STP (Sewerage Treatment Plant), STP (Sewerage Treatment Plant), threat to environment from underground and surface mining, means of mitigation, treatment of pollutants, monitoring systems, water management;mine closure plan; R&R (rehabilitation and re-settlement).RFCTLARR Act, 2013 and laws related to forest land.Technical and biological reclamation and top soil management.

Economic Impact of Mining: Economics of mining effect on community –before, during and after mining.

Materials Management for mining sector.

Behavioural Sciences for Management: Conflict management; conflict in organization; sources of conflict; dealing with conflict; organizing for conflict resolution; conflict and growth; Individual motivation; two way personal communication.

Industrial Accident: Study of human factors of industrial accidents; theircauses and remedies.

LEGISLATION:

Health and Safety Laws: The Mines Act, 1952; Mines Rules 1955, Coal Mine Regulation, 2017, Mines Rescue Rules,1985,Provisions of, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010 applicable to mines; Mine Vocational Training Rules, 1966, other rules and legislation as applicable to opencast coal mines.

GENERAL SAFETY:-

Safety in Mines: Duty of care, Occupational hazards of mining, causes and prevention of accidents and their classification; accident statistics; frequency rate andseverity rates; cause-wise analysis, basic causes of accident occurrence; investigation into accidents and accident report; in-depth study into various causes of accidents, measures for improving safety in mines; TRAP (take responsibility in accident prevention); cost of accident; SMP (Safety Management Plan); Elements of SMP, Preparation of SMP, Standard Operating Procedure (SOP) and Hazard Management Plans in opencast mines, dealing with accidents and emergencies in opencast mines, Causes of accident or incident, Accident Investigation methods and steps, Accident / Incident reporting, contribution of human elements in mine safety, workers participation in safety management; ISO and safety audit; safety conferences; tripartite and bipartite committees; role of information technology in safety management.

Risk Management: Theory and application, baseline, continuous and issue based risk assessment, how they are applied to technical areas, hazard identification, risk assessment techniques, Work Place Risk Assessment and Control (WRAC), Job Safety Analysis (JSA), Risk Matrix, Risk Management Options, Hierarchy of controls, Control Effectiveness, means of managing (minimizing or eliminating) risk, computer application and simulations, manager's role in risk management,due diligence, application of risk assessment and risk management with reference to due diligence, Concept of Triggered Action Response Plan (TARP).

Airbone dust:- Generation, dispersion, measurement and control; suppression and treatment of mine dust; sampling and analysis of air-borne dust, Hazards due to dust in mines.

Mine fires:- Cause of mine fires, spontaneous combustion, dealing with mine fires; firefighting organization; fires in quarries over developed pillars; coal stack and waste dump fires, Hazards due to extraction of developed pillars, its mitigation, Hazards due to extraction of fiery seam or hot strata.

Inrush of water: Hazards of opencast mining near water bodies, rivers, mitigation

Extreme weather condition: Occupational hazards in surface mining and precautions

Biological Hazards, Chemical Hazards

Working at heights

Mine Gases: Generation, Properties and Effects, Detection of Mine Gases, Methanometers and Multi gas Detectors, Gas Chromotograph, Flame Safety Lamps.

Mine explosions: Explosion in quarries over developed pillars, Water gas explosion.

Disaster management: Rescue and recovery; procedure and responsibilities, safety of persons engaged in emergency response, investigations and reports; assessment of damage, mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

Emergency Response Plan: Preparation of emergency response plan, Structure of emergency response system, roles and responsibilities, Emergency services, equipments and procedures, emergency control rooms.

First aid and ambulance

Notified and occupational diseases: Silicosis and pneumoconiosis., physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting: General principles of artificial lighting, lighting standards and their assessment.

Sanitation and health in mines

Safety related issues in Crushing and coal handling and transport system.

FIRST /SECOND CLASS MANAGER'S CERTIFICATE OF COMPETENCY (UNRESTRICTED)

(UNDER COAL MINES REGULATIONS. 2017)

MINE MANAGEMENT. LEGISLATION AND GENERAL SAFETY

MINE MANAGEMENT:-

Introduction: Evolution of management; theory and practice; principles of scientific management; elements of management function; planning; organization and control; structure and design of organization for mining enterprises.

Personal Management and Organizational behavior Selection: Selection, training and development of human resources for mining enterprises; leadership; study of traditional leader behaviour; autocratic, democratic and Laissez-Faire behaviours; conflict management; conflict in organization; sources of conflict; dealing with conflict; organizing for conflict resolution; conflict and growth; individual motivation; two way personal communication.

Production Management: Determination of norms and standards of operations by work study, analysis of mine capacities and capability; production planning, scheduling and control; short term and long term planning; productivity;concepts and measurements; application of Ergonomics in mine operation.

Financial Management: Capital budgeting; techniques for mining project evaluation; payback period and IRR; methods of cost analysis and cost control; break-even charts; working capital management; ERP (Enterprise Resources Planning).

Mining Environment: EIA (Environment Impact Assessment), EMP (Environment Management Plan), ETP (Effluent Treatment Plant), STP (Sewerage Treatment Plant), threat to environment from underground and surface mining, means of mitigation, treatment of pollutants, monitoring systems, water management; mine closure plan; R&R (rehabilitation and re-settlement). RFCTLARR Act, 2013 and laws related to forest land. Technical and biological reclamation and top soil management.

Economic Impact of Mining: Economics of mining effect on community –before, during and after mining; corporate social responsibility (CSR).

Materials Management for mining sector: ABC analysis, Inventory Management.Behavioural Sciences for Management: Conflict management; conflict in organization; sources of conflict; dealing with conflict; organizing for conflict resolution; conflict and growth; Individual motivation; two way personal communication.

Industrial Accident: Study of human factors of industrial accidents; their causes and remedies.

LEGISLATION:-

Health and Safety Laws: The Mines Act, 1952; Mines Rules 1955, Coal Mine Regulation, 2017, Mines Rescue Rules,1985, provisions of Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010 applicable to mines; Mine Vocational Training Rules, 1966, other rules and legislation as applicable to opencast coal mines.

GENERAL SAFETY:-

Safety in Mines: Duty of Care, Occupational hazards of mining, causes and prevention of accidents and their classification; accident statistics; frequency rate and severity rates; cause-wise analysis, basic causes of accident occurrence; investigation into accidents and accident report; in-depth study into various causes of accidents, measures for improving safety in mines; TRAP (take responsibility in accident prevention); cost of accident; SMP (SafetyManagement Plan); Elements of SMP, Preparation of SMP, Standard Operating Procedure (SOP) and Hazard Management Plans in opencast mines, dealing with accidents and emergencies in opencast mines, Causes of accident or incident, Accident Investigation methods and steps, Accident / Incident reporting, contribution of human elements in mine safety, Workers participation in safety management;ISO and safety audit; safety conferences; tripartite and bipartite committees;Role of information technology in safety management.

Risk Management: Theory and application, baseline, continuous and issue based risk assessment, how they are applied to technical areas, hazard identification, risk assessment techniques, Work Place Risk Assessment and Control (WRAC),Job Safety Analysis (JSA), Risk Matrix, Risk Management Options, Hierarchy of controls, Control Effectiveness, means of managing (minimizing or eliminating) risk, computer application and simulations, manager's role in risk management,due diligence, application of risk assessment and risk management with reference to due diligence, Concept of Triggered Action Response Plan (TARP).

Airbone dust:- Generation, dispersion, measurement and control; suppression and treatment of mine dust; sampling and analysis of mine dust, Hazards due to dust in mines.

Mine fires:- Cause of mine fires, spontaneous combustion, dealing with mine fires; firefighting organization; fires in quarries over developed pillars; coal stack and waste dump fires, Hazards due to extraction of developed pillars, its mitigation, Hazards due to extraction of fiery seam or hot strata.

Inrush of water: Hazards and risk of mining operations, surface and underground, near water bodies or unconsolidated mass and its mitigation.

Hazards due to Extreme weather condition in opencast mines and its mitigation

Occupational hazards in mining and precautions

Biological Hazards, Chemical Hazards

Working at heights

Mine Gases: Generation, Properties and Effects, Detection of Mine Gases, Methanometers and Multi Gas Detectors, Gas Chromotograph, Flame Safety Lamps

Mine explosions: Methane and Coal dust explosions, Explosion in quarries over developed pillars, Water gas explosion.

Disaster management: Emergency services, equipments and procedures, emergency control rooms, rescue and recovery; procedure and responsibilities, safety of persons engaged in emergency response. Investigations and reports;assessment of damage, mine rescue; mine gases and their physiological effects; rescue equipments; resuscitation and reviving apparatus; selection and training for rescue work.

First aid and ambulance

Notified and occupational diseases: Silicosis and pneumoconiosis, physiological aspects of breathing in dust laden atmosphere; dust sampling and sampling instruments; methods of counting and analysis; other mines diseases and their symptoms; preventions and treatment.

Lighting: General principles of artificial lighting; lighting standards and their assessment.

Sanitation and health in mines

Safety related issues in Crushing, coal handling and transport system.

Error Correction in Mine Capsule Book

Chapters	Questions No	Existing Option	Correct Options
Returns, Notices & Records	6		B 1st February
	8	c	B Form 5
Examination & Certificates of Competency	11	a	B 60days
	15	b	A
Inspector & Mine Officials	6	b	D none of the above
Winding in shafts	17	b	A
Mine Workings	1	b	D
Precautions against dangers from fire, dust, Gas and water	25	d	B
	15	b	Ans-10/6=1.6mg/m3
Mines Act	18	a	A
	23	e	H

Machinery & Plant Equipment

1. With respect to braking system in HEMM match the following:

Type of Brakes		Function	
A	Service brake	P	To prevent movement of stationary equipment
B	Emergency brake	Q	Primary braking system
C	Parking brake	R	Applied after the failure of the primary brake

a) a-q,b-r,c-p
b) a-q,b-p,c-r
c) a-p,b-r,c-p
d) a-p,b-r,c-p

Ans-a

PRACTICE PAPER-I

QNo. 3. Which of the following are true in respect to examinations of various machineries as per CMR

a. Haulage engine and rope- once atleast in every 7 days
b. Haulage track and safety devices-once atleast in every 7 days
c. Tub buffers. Draw bars and tub couplings-14 days
d. All of above

Ans-d

QNo. 35. In case of an opencast coal mines at least how man assistant manager need to be appointed if average material handled is 50000 cum?

a. Ten
b. Eleven
c. Thirteen

d. Five

Ans-a

QNo. 55. Which of the following form is not correctly matched with its description ?

a. Form2-A- Notice of change in name of mine
b. Form2-B -Notice of change in the ownership of a mine
c. Form2-C- Notice of termination of agent, manager, etc.
d. Form2-D- Notice of appointment of agent, manager, etc

Ans- c

ANSWERS

Practice Paper-1

1.c 2.a 3.d 4.c 5.a 6.d 7.c 8.b 9.b 10.b 11.c 12.c
13.c 14.c 15 b 16.b 17.c 18.b 19.c 20.a 21.a 22.b 23.b 24.c
25.a 26.a 27.b 28.b 29.a 30.a 31.a 32.c 33.b 34.d 35.d 36.d
37.b 38.a 39.b 40 c 41.b 42.c 43.a 44.a 45.c 46.a 47.a 48.a
49.b 50.d 51.a 52.b 53.a 54.d 55.b 56.d 57.a 58.a 59.b 60.c
61.c 62.d 63.c 64.c 65.a 66.d 67.a 68.d 69.d 70.b 71.b 72.a
73.c 74.d 75.b 76.c 77.b 78.d 79.a 80.a

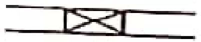
PRACTICE PAPER-II

QNo. 39. Using the ABC classification system for inventory, which of the following is a true statement?

a. The C items are of moderate capital value
b. B items are lowest consumption items
c. The A items are of low capital value
d. The A items are of high capital value

Ans-d

QNo. 40. What does this symbol indicate?



a. fire dam
b. explosion proof stopping
c. water dam
d. staple shaft

Ans-a

QNo.47. What should be minimum standard of lighting at first aid station ?

a. 50 H
b. 10 H
c. 25 H
d. 20 H

Ans-a

Practice Paper-2

1.c 2.b 3.a 4.b 5.b 6.b 7.b 8.c 9.d 10.c 11.d 12.a
13.d 14.b 15.a 16.b 17.b 18.c 19.d 20.b 21.a 22.b 23.b 24.d
25.d 26.c 27.d 28.c 29.c 30.a 31.d 32.b 33.d 34.b 35.b 36.d
37.b 38.a 39.a 40.b 41.c 42.d 43.b 44.b 45.b 46.50 mm 47.b 48.c
49.b 50.b 51.d 52.c 53.c 54.d 55.c 56.a 57.b 58.d 59.b 60.d
61.a 62.a 63.b 64.a 65.c 66.d 67.b 68.b 69.a 70.c 71.d 72.d
73.a 74.b 75.c 76.a 77.a 78.b 79. 95 dB 80. II & III

Gazette Notification which came after publication of BOOK regarding number of appointment of Assistant Manager &Surveyors,

CMR 30. Appointment of assistant managers – In every belowground mine the average output of which exceeds 7,000 tonnes, the manager shall be assisted by assistant managers on the following scale:

Average output per month	Number of assistant managers
Up to and including 10,000 tonnes	One
Above 10,000 tonnes	One additional assistant manager for every 5,000 tonnes output or part thereof in excess of 10,000 tonnes

Provided that in a mine where the average output exceeds 20,000 tonnes, at least one of the assistant managers as aforesaid shall hold a First Class Manager's Certificate.

Opencast mines:

In every mine the manager shall be assisted by assistant managers on the following scale:

Average material handled	Number of assistant managers
Up to and including 1 million cubic metre	Ten
Above 1 million cubic metre	One additional assistant manager for every 1 million cubic metre of average material handled or part thereof in excess of 1 million cubic metre.

At least 30 % of the assistant managers required in an opencast mine shall be holder of First Class Manager's Certificate.

Note: (a) The expression "average material handled" of any mine means 'the average material (coal and overburden material) handled per year during three preceding financial years from all workings within the specified mine boundaries.

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CMR 34. Appointment of surveyors-

Underground mines:

The number of surveyors required to be appointed shall be on the following scale namely:

Average output	Number of surveyors
8,000 tonnes and below	One
Above 8,000 tonnes	One additional surveyor for every additional 15,000 tonnes or part thereof.

Provided that for calculating the output of the mine only half of the output in the mine obtained from the depillaring operations shall be taken into consideration

Opencast mines:

The number of surveyors required to be appointed shall be on the following scale namely;

Average material handled	Number of surveyors
Up to 1 million cubic metre	Two
Above 1 million and up to 5 million cubic metre	Three
Above 5 million cubic metre and up to 10 million cubic metre	Four
Above 10 million cubic metre and up to 15 million cubic metre	Six
Above 15 million cubic metre	One additional surveyor for every ten million cubic metre of average material handled or part thereof in excess of 15 million cubic metre . and that value to be added by a figure of 6 (Six).

Refrences

1. McPherson, M. J. (1993); Subsurface Ventilation and Environmental Engineering"; Chapman & Hall, London.
2. Deshmukh, D. J. (2008); "Elements of Mining Technology, Vol. –II"; Denett & Co., Nagpur, India.
3. Ramlu, M. A. (1991); "Mine fires, Explosions, Rescue,Recovery and Inundations"; Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
4. Prof B K Kejriwal,The mines Act,1952,lovely prakashan